Northwest Power and Conservation Council's
Columbia River Basin
Fish and Wildlife Program

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I. Introduction

A. The Northwest Power and Conservation Council and the Columbia River Basin Fish and Wildlife Program

The Northwest Power and Conservation Council, an interstate compact agency of Idaho, Montana, Oregon and Washington, was established under the authority of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Northwest Power Act or Act). The Act directs the Council to develop a program to "protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat, on the Columbia River and its tributaries … affected by the development, operation, and management of [hydroelectric projects] while assuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply." The Act also directs the Council to ensure widespread public involvement in the formulation of regional power and fish and wildlife policies.

This document is the Council's *Columbia River Basin Fish and Wildlife Program*. As a planning, policy-making and reviewing body, the Council develops the program, and then monitors its implementation by the Bonneville Power Administration, the U.S. Army Corps of Engineers, the Bureau of Reclamation and the Federal Energy Regulatory Commission and its licensees.

The Northwest Power Act directs the Council to develop its program and make periodic major revisions by first requesting recommendations from the region's federal and state fish and wildlife agencies, appropriate Indian tribes (those within the basin) and other interested parties. The Council also takes comment from designated entities and the public on those recommendations. The Council then issues a draft amended program, initiating an extensive public comment period on the recommendations and proposed program amendments that includes extensive written comments, public hearings in each of the four states, and consultations with interested parties.

After closing the comment period, and following a review and deliberation period, the Council adopts the revised program. The Council develops its final program on the basis of the amendment recommendations, information submitted in support of the recommendations, and views and information obtained through public comment and participation and through consultation with the fish and wildlife agencies, tribes, Bonneville customers and others. The program amendments are not concluded until the Council adopts written findings as part of the program explaining its basis for adopting or not adopting program amendment recommendations.

B. The Program Framework

The program's goals, objectives, scientific foundation and actions are organized in a "framework," an integrated approach to regional fish and wildlife mitigation and recovery. With the framework concept, the Council intends to bring together, as closely as possible, Endangered Species Act requirements, the broader requirements of the Northwest Power Act, and the policies of the states and Indian tribes into a comprehensive program with a solid scientific foundation. The program states explicitly what the Council is trying to accomplish, links the program to a specific set of objectives, describes the strategies to be employed and establishes a scientific basis for the program. Thus, the program guides decision-making and provides a reference point for evaluating success.

The fundamental elements of the program framework are:

- The vision, which describes what the program is trying to accomplish with regard to fish and wildlife, in the context of other desired benefits from the river;
- The biological objectives, which describe the ecological conditions and population characteristics needed to achieve the vision;
- The implementation strategies, procedures, assumptions and guidelines, which guide or describe the actions leading to the desired ecological conditions; and
- The scientific foundation, which ties the program framework together.

In other words, the vision implies biological objectives that set the strategies. In turn, strategies address biological objectives and fulfill the vision. The scientific foundation links the components of the framework, explaining why the Council believes certain kinds of management actions will result in particular physical habitat or ecological conditions of the basin, and why the ecological conditions will affect fish and wildlife populations or communities in a desired way to achieve the vision.

The program is organized in three levels: 1) a basinwide level that contains the program vision, scientific foundation, biological objectives, general strategies, and implementation provisions that apply generally across the program and are implemented throughout the basin; 2) an ecological province level that divides the Columbia River Basin into 11 unique ecological areas, each representing a particular type of terrain and corresponding biological community; and 3) a subbasin level, with integrated plans that contain the specific objectives and measures for the nearly 60 subbasins and mainstem reaches of the Columbia, as well as a special plan tying together the mainstem Columbia and Snake rivers and a plan for the Columbia River estuary.

Since its inception in 1982, the Council's program has emphasized an adaptive-management approach. This is imperative given the significant level of uncertainty as to whether any particular protection or mitigation activity will contribute to long-term sustained improvement in fish or wildlife adversely affected by the hydrosystem. This means, among other things, the need for a close and appropriate interaction between science and policy decision-making. Policy-makers must develop clear and conceptually

consistent management actions and corresponding questions that focus on the uncertainties inherent in those actions. Scientists must help policy-makers by explaining the current level of technical knowledge and the relative confidence level the scientists have in that information, describe how best to monitor and address the uncertainties, and frame the relative risks of the different policy options the science may present. Policy-makers must then manage the uncertainty and risk in making and adapting decisions.

Under the Northwest Power Act, the Council's fish and wildlife program is not intended to address all fish and wildlife problems in the basin from all sources. The Council adopted the vision, objectives, strategies and scientific foundation with the belief that they will complement and help support other fish and wildlife recovery actions in the region.

Throughout the basin, the NOAA's National Marine Fisheries Service (NOAA Fisheries) and the U.S. Fish and Wildlife Service are administering the Endangered Species Act, which requires information gathering, planning, and mitigation actions. In addition, the Environmental Protection Agency, in cooperation with the other federal agencies, states and tribes, is taking actions to achieve compliance with the Clean Water Act (as used elsewhere in this program, "applicable federal laws" includes both the Endangered Species Act and the Clean Water Act). The four Northwest states and the Columbia Basin's Indian tribes also all have fish and wildlife initiatives under way.

The Program framework is not intended to pre-empt the legal authorities of any of these parties, but it does provide an opportunity for each of these regional participants to coordinate information gathering, planning, and implementation of recovery actions on a voluntary basis. That is, the Council's program is designed to link to, and accommodate, the needs of other programs in the basin that affect fish and wildlife. This includes meeting the needs of the Endangered Species Act by describing the kinds of ecological change needed to improve the survival and productivity of the diverse fish and wildlife populations in the basin.

Measures implementing this program are funded by the Bonneville Power Administration through revenues collected from electricity ratepayers. Although Bonneville has fish and wildlife responsibilities under both the Endangered Species Act and the Northwest Power Act, both responsibilities are met in the same set of actions. Therefore, in recommending projects for funding under this program, the Council will address both sets of responsibilities wherever feasible. Again, knowledge of the plans and activities of other regional participants will be essential for the Council to be able to assure that the projects it recommends for funding are coordinated with, and do not duplicate, the actions of others.

C. Implementation and Performance

Since the last revision of the program and the development of the program framework in 2000, the Council sparked the development of nearly 60 subbasin plans and then added the plans to the program, providing a coordinated and integrated home for fish and wildlife actions across the basin. The federal, state and tribal governments have been working with local partners to expand the subbasin plans into draft and final ESA recovery plans in areas of the basin that include ESA-listed populations.

Then in 2007-08, Bonneville and other agencies of the federal government committed to extensive implementation plans built on this broader planning foundation, commitments to fund an extensive set of actions over the next ten years to benefit listed and unlisted anadromous and resident fish across the Columbia River Basin. These include mainstem, estuary and tributary habitat, production, harvest, and monitoring actions committed to by the agencies as part of the consultation resulting in the 2008 Biological Opinion for the Federal Columbia River Power System and in the Columbia Basin Fish Accords ("Accords") executed with certain Indian tribes and states. Many areas of the program are covered by multi-year implementation plans. In areas not covered, the core implementation actions are well known and will be shaped into similar multi-year implementation plans in the near future.

All these plans and implementation actions are built on the mainstem and off-site mitigation foundations developed in the Council's program over the past 27 years, from the water management and passage measures in the 1982 Program to the 2004-05 subbasin plans. The program has identified the basin's biological potential and the opportunities for improvements. As a consequence of the Accords and the biological opinions, there are significant financial commitments to implement suites of actions over the next ten years to try to capture that potential.

The focus of the program and the Council now turns to performance. The revised program has increased emphasis on periodic science review of new and ongoing actions; increased requirements for reporting of results and accountability; an emphasis on adaptive management as a way to solve continuing uncertainties; a renewed push to develop a better set of quantitative objectives for the regional program; a commitment to a periodic and systematic exchange of science and policy information; and especially an expanded monitoring and evaluation framework with a commitment to use the information to make better decisions and report frequently on program progress.

II. Basinwide Provisions

A. Vision for the Columbia River Basin

The vision is the outcome intended for this program. Actions taken at the basin, province, and subbasin levels should be consistent with, and designed to fulfill, the vision. Thus, the vision guides the choice of biological objectives and, in turn, the selection of strategies.

1. The Overall Vision for the Fish and Wildlife Program

The vision for this program is a Columbia River ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife, mitigating across the basin for the adverse effects to fish and wildlife caused by the development and operation of the hydrosystem. This ecosystem provides abundant opportunities for tribal trust and treaty-right harvest and for non-tribal harvest and the conditions that allow for the recovery of the fish and wildlife affected by the operation of the hydrosystem and listed under the Endangered Species Act.

Wherever feasible, this program's vision will be accomplished by protecting and restoring the natural ecological functions, habitats, and biological diversity of the Columbia River Basin. Where this is not feasible, other methods that are compatible with naturally reproducing fish and wildlife populations will be used, including certain forms of artificial production. Where impacts have irrevocably changed the ecosystem, the program will protect and enhance the habitat and species assemblages compatible with the altered ecosystem. Actions taken under this program must be cost-effective and consistent with an adequate, efficient, economical, and reliable electrical power supply.

The development and operation of the hydrosystem is not the only human cause of adverse effects to fish and wildlife in the Columbia River Basin. However, improving conditions for fish and wildlife affected by the hydrosystem is a responsibility the Council and its program shares with citizens, private entities, and government agencies across the region.

2. Planning Assumptions

As part of this vision, the Council adopts the following policy judgments and planning assumptions for the fish and wildlife program:

- No single activity is sufficient to recover and rebuild fish and wildlife species in the Columbia River Basin. Successful protection, mitigation, and recovery efforts must involve a coordinated strategy for habitat protection and improvement, hydrosystem reform, artificial production, and harvest management. There also must be coordination with actions not funded under this program.

- Bonneville Power Administration and its ratepayers shall bear the cost of measures designed to deal with adverse impacts caused by the development and operation of the hydroelectric facilities only. The hydroelectric power system is only one factor in the loss of fish and wildlife in the Columbia River Basin. The Council's program includes measures that directly address the impacts of the hydrosystem on fish and wildlife. The program also includes measures that address limiting factors *not* caused by the hydrosystem, as the Northwest Power Act authorizes the program to contain and Bonneville to fund off-site protection and mitigation measures to compensate for losses arising from the development and operation of the hydroelectric facilities of the Columbia River and its tributaries. The "nexus" to the hydrosystem that allows a measure to be an appropriate part of the program is whether the measure will provide protection or mitigation benefits for fish or wildlife adversely affected by the hydrosystem, benefits that can be said to compensate for effects not already mitigated.

  On that basis, the program identifies a comprehensive set of interrelated fish and wildlife problems and responsive strategies. While all such strategies are within Bonneville's authority to fund as offsite mitigation to address its mitigation obligation, the extent of Bonneville's funding obligations in any particular rate period will be determined through the program's implementation provisions. At any one time, program implementation will include both measures addressing the direct impacts of the hydrosystem and off-site mitigation measures. Together they must be sufficient to mitigate for the impacts of the Columbia hydropower system on fish and wildlife. The Council will work with Bonneville, the fish and wildlife managers, and others to develop budgets, implementation plans, and project recommendations that provide sufficient guidance to Bonneville about the level of effort necessary in any particular period to be acting in a manner consistent with the program.

Habitat

- This is a habitat-based program. The program aims to rebuild healthy, naturally producing fish and wildlife populations by protecting, mitigating, and restoring habitats and the biological systems within them, including anadromous fish migration corridors. Artificial production and other non-natural interventions should be consistent with this effort and avoid adverse impacts to native fish and wildlife species.

- Because ecosystems are highly complex and variable, actions addressing ecosystem problems must be taken in an adaptive, experimental manner. Where the efficacy of management actions is uncertain and may involve significant risk, actions must include experimental designs and techniques as well as monitoring and research to evaluate ecosystem effects.

- Ocean conditions should be considered in evaluating freshwater habitat management to understand all stages of the salmon and steelhead life cycle.

- Climate change could have significant impacts on mainstem Columbia and Snake river flows in terms of water quality, water quantity, and temperature. Possible changes in regional snowpack, river flows, and reservoir elevations due to climate change could have a profound impact on the success of restoration efforts and the status of Columbia Basin fish and wildlife populations. The Council acknowledges that global climate change is not directly caused by the Federal Columbia River Power System (FCRPS). However, to the extent climate change may adversely impact fish and wildlife affected by the hydrosystem, it is appropriate for the Council to seek the best available scientific knowledge regarding the effects of climate change on Columbia River Basin fish and wildlife and to consider that scientific data when recommending strategies and implementing measures to mitigate losses arising from the development and operation of the hydroelectric facilities of the Columbia River and its tributaries. Planning efforts must also take into account the potential effects that increases and shifts in human population may have on the condition of fish and wildlife habitats.

Hydrosystem

- Mainstem hydrosystem operations and fish-passage efforts should be directed at optimizing the survival of focal species. Such efforts should include re-establishing natural river processes to the extent feasible and consistent with the Council's responsibility to maintain an adequate, efficient, economical, and reliable power supply.

- Actions to improve juvenile and adult fish passage through mainstem dams, including fish transportation actions and capital improvement measures, should protect biological diversity by benefiting the range of species, stocks, and life-history types in the river, and should favor solutions that best fit natural behavior patterns and river processes, while maximizing fish survival

through the hydroelectric projects. Survival in the natural river should be the baseline against which to measure the effectiveness of other passage methods.

- Systemwide water management, including flow augmentation from storage reservoirs, should balance the needs of anadromous fish species with those of resident fish species in upstream storage reservoirs so that actions taken to advance one species do not unnecessarily disadvantage other species.

Artificial Production

- There is an obligation to provide fish and wildlife mitigation where habitat has been permanently lost due to hydroelectric development. Artificial production of fish may be used to replace capacity, bolster productivity, and alleviate harvest pressure on weak, naturally spawning resident and anadromous fish populations. Restoration of anadromous fish into areas blocked by dams should be actively pursued where feasible.

- Artificial production actions must have an experimental, adaptive-management design. This design will allow the region to evaluate benefits, address scientific uncertainties, and improve hatchery survival while minimizing the impact on, and if possible benefiting, fish that spawn naturally.

Harvest

- Harvest can provide significant cultural and economic benefits to the region, and the program should seek to increase harvest opportunities consistent with sound biological management practices. Harvest rates should be based on population-specific adult escapement objectives designed to protect and recover naturally spawning populations.

B. Scientific Foundation and Principles

The scientific foundation reflects the best available scientific knowledge. The scientific principles summarize this knowledge at a broad level. The action taken at the basin, province, and subbasin levels to fulfill the vision should be consistent with, and based upon, these principles.

1. Purpose of the Scientific Foundation

While the vision is a policy choice about what the program should accomplish, the scientific foundation describes our best understanding of the biological realities that will govern how the vision is accomplished. The scientific foundation is not only the basis for the working hypotheses that underlie this program but also provides specific guidance for program measures.

In addressing the needs of Columbia River Basin fish and wildlife, the Council recognizes the need for prompt action to arrest declines in many populations despite a limited or conflicting scientific basis. Congress specifically addressed this challenge by directing the Council, in the Northwest Power Act, to use the best *available* scientific information and not to await scientific certainty prior to acting. The Council remains committed to utilizing adaptive management as one tool to continually improve the program's scientific foundation.[1]

2. Scientific Principles

As part of the scientific foundation, the program recognizes eight principles of general application. The scientific principles are grounded in established scientific literature to provide a stable foundation for the Council's program. Although scientific knowledge will improve over time, modification of the principles should occur only after due scientific deliberation. The Council charges the Independent Scientific Advisory Board with the primary role in reviewing and recommending modifications to the scientific principles.

All actions taken to implement this program must be consistent with the following principles:

Principle 1: The abundance, productivity, and diversity of organisms are integrally linked to the characteristics of their ecosystems.
The physical and biological components of ecosystems together produce the diversity, abundance and productivity of plant and animal species, including humans. The combination of suitable habitats and necessary ecological functions

[1] As described in the *ISRP 2007 Retrospective Report* (ISRP 2008-4), project proposals should provide 1) an experimental design to identify whether biological objectives have been met by employing specific strategies; or 2) a decision tree that would be used to modify management based on updated scientific information.

forms the ecosystem structure and conditions necessary to provide the desired abundance and productivity of specific species.

Principle 2: Ecosystems are dynamic, resilient, and develop over time.
Although ecosystems have definable structures and characteristics, their behavior is highly dynamic, changing in response to internal and external factors. The system we see today is the product of its biological, human, and geological legacy. Natural disturbance and change are normal ecological processes and are essential to the structure and maintenance of habitats.

Principle 3: Biological systems operate on various spatial and time scales that can be organized hierarchically.
Ecosystems, landscapes, communities, and populations are usefully described as hierarchies of nested components distinguished by their appropriate spatial and time scales. Higher-level ecological patterns and processes constrain, and in turn reflect, localized patterns and processes. There is no single, intrinsically correct description of an ecosystem, only one that is useful to management or scientific research. The hierarchy should clarify the higher-level constraints as well as the localized mechanisms behind the problem.

Principle 4: Habitats develop, and are maintained, by physical and biological processes.
Habitats are created, altered, and maintained by processes that operate over a range of scales. Locally observed conditions often reflect more expansive or non-local processes and influences, including human actions. The presence of essential habitat features created by these processes determines the abundance, productivity, and diversity of species and communities. Habitat restoration actions are most effective when undertaken with an understanding and appreciation of the underlying habitat-forming processes.

Principle 5: Species play key roles in developing and maintaining ecological conditions.
Each species has one or more ecological functions that may be key to the development and maintenance of ecological conditions. Species, in effect, have a distinct job or occupation that is essential to the structure, sustainability, and productivity of the ecosystem over time. The existence, productivity, and abundance of specific species depend on these functions. In turn, loss of species and their functions lessens the ability of the ecosystem to withstand disturbance and change.

Principle 6: Biological diversity allows ecosystems to persist in the face of environmental variation.
The diversity of species, traits, and life histories within biological communities contributes to ecological stability in the face of disturbance and environmental change. Loss of species and their ecological functions can decrease ecological stability and resilience. It is not simply that more diversity is always good;

introduction of non-native species, for example, can increase diversity but disrupt ecological structure. Diversity within a species presents a greater range of possible solutions to environmental variation and change. Maintaining the ability of the ecosystem to express its own species composition and diversity allows the system to remain productive in the face of environmental variation.

Principle 7: Ecological management is adaptive and experimental.
The dynamic nature, diversity, and complexity of ecological systems routinely disable attempts to command and control the environment. Adaptive management -- the use of management experiments to investigate biological problems and to test the efficacy of management programs -- provides a model for experimental management of ecosystems. Experimental management does not mean passive "learning by doing," but rather a directed program aimed at understanding key ecosystem dynamics and the impacts of human actions using scientific experimentation and inquiry.

Principle 8: Ecosystem function, habitat structure, and biological performance are affected by human actions.
As humans, we often view ourselves as separate and distinct from the natural world. However, we are integral parts of ecosystems. Our actions have a pervasive impact on the structure and function of ecosystems, while at the same time, our health and well-being are tied to ecosystem conditions. Our actions must be managed in ways that protect and restore ecosystem structures and conditions necessary for the survival and recovery of fish and wildlife in the basin. Success depends on the extent to which we choose to control our impacts so as to balance the various services potentially provided by the Columbia River Basin.

C. Biological Objectives

1. Basin-Level Biological Objectives

Biological objectives describe the physical and biological changes needed to achieve the basinwide vision. Basin-level biological objectives are useful for determining the amount of basinwide change needed to fulfill the vision, determining the cost effectiveness of various basinwide strategies, and assessing overall program effectiveness.

Where possible, biological objectives should be empirically measurable and based on an explicit scientific rationale. Basinwide objectives are generally expressed in qualitative terms. At the province and subbasin levels, however, biological objectives should be expressed in quantitative and measurable terms.

Biological objectives have two components: 1) biological performance, which describes population responses to habitat conditions (in terms of capacity, abundance, productivity, and life history diversity); and 2) environmental characteristics, which describe the environmental conditions necessary to achieve desired population characteristics.

a. Objectives for Biological Performance

The Council recognizes that significant losses of fish, wildlife, and their habitats have occurred due to the development and operation of the Federal Columbia River Power System. Consistent with the Northwest Power Act, these losses establish the basis for population objectives.

Anadromous Fish Losses

Mitigating for losses of anadromous fish caused by the development and operation of the hydrosystem is at the core of the Council's program. The "Compilation of Salmon and Steelhead Losses in the Columbia River Basin" and the "Numerical Estimates of Hydropower-related Losses" (included in the Appendix), are a starting place for understanding the magnitude of these losses.

The biological objectives at the basinwide level describe the broad changes that need to occur in the environment and the resulting changes needed in biological performance to address these losses. The following objectives address anadromous fish losses:

- Halt declining trends in Columbia River Basin salmon and steelhead populations, especially those that originate above Bonneville Dam. Significantly improve the smolt-to-adult survival rates (SARs) for Columbia River Basin salmon and steelhead, resulting in productivity well into the range of positive population replacement. Continue restoring the characteristics of healthy lamprey populations.

- Restore the widest possible set of healthy, naturally reproducing and sustaining populations of salmon and steelhead in each relevant ecological province.

- Significantly increase the total adult salmon and steelhead runs in the Columbia River Basin, especially those that originate above Bonneville Dam, in a manner that supports tribal and non-tribal harvest. Efforts must be consistent with achieving recovery of ESA-listed populations and preventing additional ESA listings of species. Within 100 years, achieve population characteristics that, while fluctuating due to natural variability, represent on average full mitigation for losses of anadromous fish.

- Restore lamprey passage and habitat in the mainstem and in tributaries that historically supported spawning lamprey populations. Attain self-sustaining and harvestable populations of lamprey throughout their historical range. Mitigate for lost lamprey production in areas where restoration of habitat or passage is not feasible.

Fish and wildlife agencies and tribes recommended that the program continue to include a set of quantitative goals and timelines related to these objectives. These include, among others, increasing total adult salmon and steelhead runs to an average of 5 million annually by 2025 in a manner that emphasizes the populations that originate above Bonneville Dam and supports tribal and non-tribal harvest, and achieving smolt-to-adult survival rates (SARs) in the 2-6 percent range (minimum 2 percent; average 4 percent) for listed Snake River and upper Columbia salmon and steelhead.

Within two years of adopting the amended program, the Council will work with the fish and wildlife agencies, tribes, and others to initiate a process specifically aimed at assessing the value for the program of quantitative biological objectives at the basinwide level (or at any level above the subbasin and population level) and, if determined to be useful, develop a scientifically rigorous set of such quantitative objectives.

Substitution for Anadromous Fish Losses

Where some anadromous fish losses occur in blocked areas, mitigation for these losses must also occur in these blocked areas pursuant to the program's resident fish substitution Policy. The "Compilation of Salmon and Steelhead Losses in the Columbia River Basin" and the "Numerical Estimates of Hydropower-related Losses" adopted in the Council's 1987 fish and wildlife program (included in the Appendix) are the starting points for the Council's approach regarding substitution.

The following principles address anadromous fish losses and mitigation requirements caused by development and operation of hydroelectric facilities in all blocked areas:

- Investigate reintroduction of anadromous fish into blocked areas, where feasible.
- Restore and increase the abundance of native resident fish species throughout their historic ranges when original habitat conditions exist or can be feasibly restored or improved.
- Develop and increase opportunities for consumptive and non-consumptive resident fisheries for native, introduced, wild, and hatchery-reared stocks that are compatible with the continued persistence of native resident fish species and their restoration to near their historic abundance.
- When full mitigation by improving the abundance of native fish species is not feasible, manage non-native fish to maximize use of available existing and improved habitats to provide a subsistence

and sport fishing resource, without adversely affecting native fish populations.

Resident Fish Losses

The development and operation of the hydrosystem has resulted in losses of native resident fish and resident fish diversity for species such as bull trout, cutthroat trout, kokanee, white sturgeon and other species. The following objectives address resident fish losses:

- Where feasible, complete the basinwide assessments of resident fish losses resulting from the development and operation of the hydrosystem. As these are available, the Council will consider adopting the loss assessments into the program.

- Maintain and restore healthy ecosystems and watersheds that preserve functional links among ecosystem elements to ensure the continued persistence, health, and diversity of all species including game fish species, non-game fish species, and other organisms.

- Protect and expand habitat and ecosystem functions in order to increase the abundance, productivity, and life history diversity of resident fish at least to the extent that resident fish have been affected by the development and operation of the hydrosystem.

- Achieve population characteristics of resident fish species within 100 years that represent, on average, full mitigation for losses of resident fish.

Wildlife Losses

Development and operation of the hydrosystem resulted in wildlife losses through construction of dams and inundation of habitat, direct operational losses, and secondary losses. The program includes measures and implements projects to acquire and protect habitat units as mitigation for construction and inundation losses. The program maintains a commitment to mitigate for operational and secondary losses that have not been estimated or addressed. The following objectives address wildlife losses more specifically:

- Complete the mitigation to address the assessed losses caused by the construction of the hydrosystem facilities and the resulting inundation of land. As appropriate, complete wildlife loss assessments for losses caused by operation of the hydropower projects.

- Develop and implement habitat acquisition and enhancement projects to fully mitigate for identified losses.

- Coordinate habitat restoration and acquisition activities throughout the basin with fish mitigation and restoration efforts to promote terrestrial and aquatic area connectivity.

- Maintain existing and created habitat values.

- Monitor and evaluate habitat and species responses to mitigation actions.

b. Objectives for Environmental Characteristics

Basin-level environmental characteristics describe the kinds of environmental changes needed across the Columbia River Basin to achieve the basinwide biological performance objectives. The following objectives address environmental characteristics:

- Identify and protect habitat areas and ecological functions that are relatively productive for spawning, resting, rearing, and migrating salmon and steelhead in the mainstem. Restore and enhance habitat areas that connect to the productive areas to support expansion of productive populations and to connect weaker and stronger populations so as to restore more natural population structures.

- Protect, enhance, restore, and connect freshwater habitat in the mainstem for the life history stages of naturally spawning anadromous and resident salmonids.

- Protect and enhance ecological connectivity between aquatic areas, riparian zones, floodplains, and uplands. Enhance the connections between rivers and their floodplains, side channels, and riparian zones.
    - Manage mainstem riparian areas to protect aquatic conditions and form a transition to floodplain terrestrial areas and side channels.
    - Identify, protect, enhance, and restore the functions of alluvial river reaches. Where feasible, reconnect protected and enhanced tributary habitats to protected and enhanced habitats, especially in the area of productive populations.

- Allow for biological diversity to increase among and within populations and species to increase ecological resilience to environmental variability.
    - Expand the complexity and range of habitats to allow for greater life history and species diversity.
    - Manage human activities to minimize artificial selection or limitation of life history traits.
    - Where feasible, support patterns of water flow that more closely approximate natural hydrographic patterns in terms of quantity, quality, and fluctuation. Ensure that any changes in water management are premised upon, and proportionate to, scientifically demonstrated fish and wildlife benefits.
    - Frame habitat restoration in the context of measured trends in water quantity and quality.
    - Allow for seasonal fluctuations in flow, including floods. Reduce large and rapid short-term fluctuations.

- Increase the correspondence between water temperatures and the naturally occurring regimes of temperatures throughout the basin. To the extent possible, use stored water to manage water temperatures downstream from storage reservoirs where temperature benefits from releases can be shown to provide improved fish survival.

- Identify, protect, enhance, restore, and connect ecosystem functions in the Columbia River estuary and nearshore ocean discharge plume as affected by actions within the Columbia River mainstem. Evaluate flow regulation and changes to estuary-area habitat and biological diversity to better understand the relationship between estuary ecology and near-shore plume characteristics and the productivity, abundance, and diversity of salmon and steelhead populations.

2. Further Development of Biological Objectives

The program contains *qualitative* objectives for desired change in biological performance and environmental characteristics. It also includes quantitative objectives relating to wildlife mitigation in the construction and inundation loss assessments, and a significant set of quantitative objectives for anadromous and resident fish at the subbasin level.

The Council will work with the federal and state fish and wildlife agencies and tribes, Bonneville, and others before the next program amendment in a process specifically aimed at assessing the value for the program of quantitative biological objectives at the basinwide level, or at any level above the subbasin and population level. If determined to be useful in certain categories, the Council will work with these partners to develop a set of quantitative objectives for amendment into the program.

D. Basinwide Strategies

Basinwide strategies are plans of action to accomplish the basinwide biological objectives. Strategies at the basin level consist of programmatic guidelines for planning and implementation at the subbasin and province level and include specific measures that transcend specific subbasins and provinces, such as research, monitoring, and evaluation. Strategies to protect, mitigate, and enhance fish and wildlife should consider current as well as future environmental conditions.

Implementation of strategies at all program levels will be more effective if developed further into coordinated, multi-year implementation plans with a sufficient funding commitment and clear obligations for ongoing performance review and reporting. In 2008, Bonneville and the other federal agencies made such implementation commitments to certain elements of the program, as described in the program's Introduction and Implementation Provisions. The Council will work with Bonneville and other program partners to develop multi-year implementation plans in areas lacking funding commitments. The Council will work with Bonneville to ensure reasonable implementation of all multi-year plans.

1. Habitat Strategies

Primary strategy: Identify the current condition and biological potential of the habitat, and then protect or restore it to the extent described in the Biological Objectives section.

This program relies heavily on protection of, and improvements to, inland habitat as the most effective means of restoring and sustaining fish and wildlife populations. However, it also recognizes that depending on the condition of the habitat and the target species, certain categories of mitigation investments are likely to be more effective than others. Thus, an important function of this strategy is to direct investments to their most productive applications.

Changes in the hydrosystem are unlikely within the next few years to fully mitigate impacts to fish and wildlife. However, the Northwest Power Act allows off-site mitigation for fish and wildlife populations affected by the hydrosystem. Because some of the greatest opportunities for improvement lie outside the immediate area of the hydrosystem -- in the tributaries and subbasins off the mainstem of the Columbia and Snake Rivers, and in the lower Columbia River and estuary -- this program seeks habitat improvements outside the hydrosystem as a means of offsetting some of the impacts of the hydrosystem.

For example, passage through the hydrosystem causes loss to salmon, steelhead, lamprey, and some resident fish. Measures at the dams can and should be taken to reduce this loss. As an offset for hydrosystem-caused losses, the program may also call for improvements in spawning and rearing habitats in tributaries, the lower river, and estuary. By restoring these habitats, which were not damaged by the hydrosystem, the program helps compensate for the existence of the hydrosystem.

Habitat considerations extend beyond the tributaries, however. Historically, the mainstem Columbia and Snake rivers were among the most productive spawning and rearing habitats for salmonids and provided essential resting and feeding habitat for mainstem resident and migrating fish. Protection and restoration of mainstem habitat conditions must be a critical piece of this habitat-based program.

Subbasin plans have been developed for most of the subbasins in the Columbia River Basin, including sections of the mainstem Columbia and Snake rivers and the estuary. Subbasin plans include assessments of current physical and biological conditions and also identify factors that limit the productivity and capacity of focal species in priority reaches. Management plans in the subbasin plans respond to the habitat improvements that are needed.

There is a variety of potentially successful approaches that may be used to improve and maintain habitat. The Council believes that the decision of which approach to use is best made at the local, site-specific level, subject to scientific

review. However, all subbasin plans, and measures within those plans, should be consistent with the vision and biological objectives of the program, and the following strategies:

a. Build from Strength

Efforts to improve the status of fish and wildlife populations in the basin should protect habitat that supports existing populations that are relatively healthy and productive. Adjacent habitats should be expanded if they have been historically productive or have a likelihood of sustaining healthy populations by reconnecting or improving habitat. In a similar manner, this strategy applies to the restoration of weak stocks: the restoration should focus first on the habitat where portions of the weak populations are doing relatively well and then extend to adjacent habitats.

Strongholds

A salmon, steelhead or resident fish stronghold refers to a subbasin, watershed or other defined spatial area where populations are stronger and genetically more diverse than other areas. The Council will work with regional entities to establish criteria for identification of stronghold areas within the Columbia River Basin. The Council may consider additional funding in these areas to provide further protection and to reduce impacts of limiting factors. Strongholds will emphasize the preservation and restoration of habitat for wild fish

b. Restore Ecosystems, Not Just Single Species

Increasing the abundance of single populations may not, by itself, result in long-term recovery. Restoration efforts must focus on restoring habitats and developing ecosystem conditions and functions that will allow for expanding and maintaining diversity within and among species. This will help sustain a system of robust populations in the face of environmental variation.

c. Use Native Species Wherever Feasible

Even in degraded or altered environments, native species in native habitats provide the best starting point and direction for needed biological conditions in most cases. Where a species native to that particular habitat cannot be restored, then another species native to the Columbia River Basin should be used. Any proposal to produce or release non-native species must overcome this strong presumption in favor of native species and habitats and be designed to avoid adverse impacts on native species.[2]

[2] Further detail on matters relating to non-native species and to the use of native and non-native species in resident fish substitution may be found in section 2 below.

d. Address Transboundary Species

Because about 15 percent of the Columbia River Basin is in British Columbia, including the headwaters of the Columbia and several of its key tributaries, ecosystem restoration efforts should address transboundary stocks of fish and wildlife and transboundary habitats. Where mitigation measures are designed to benefit both American and Canadian fish and wildlife populations, American ratepayer funding should be in proportion to anticipated benefits to the American populations.

e. Protected Areas (Future Hydroelectric Development and Licensing)

The Council has adopted a set of standards for the Federal Energy Regulatory Commission, the Bonneville Power Administration, and other federal agencies to apply to the development and licensing of new hydroelectric facilities in the Columbia River Basin. As part of this effort, the Council designated certain river reaches in the basin as "protected areas." The Council found that new hydroelectric development in a designated protected area would have unacceptable risks of loss to fish and wildlife species of concern, their productive capacity, or their habitat.

The Council expects the Federal Energy Regulatory Commission, in the exercise of its licensing authority under the Federal Power Act, to take the Council's protected areas decision into account to the fullest extent practicable. The Commission should implement the Council's decision in the Commission's licensing and exemption proceedings unless the Commission's legal responsibilities *require* otherwise. The Council also expects Bonneville not to acquire power from or provide transmission support for a new hydroelectric development in a manner inconsistent with the Council's designation of protected areas. The standards, and the conditions relating to that protection, are identified in the Future Hydroelectric Development section of the Appendix to this program.

f. Habitat Protection and Improvement Activities to Address Biological Objectives

Habitat work is intended to be consistent with the program's biological objectives and also with measures contained in subbasin plans. The most common habitat protection and improvement activities implemented under the program consist of:

- Removal of passage barriers
- Diversion screening
- Riparian habitat protections and improvements (fencing, vegetation planting, erosion control, best land management practices, easements, and other acquisitions) largely intended to improve water quality, especially with regard to temperature and sediments

- Water transactions and conservation activities to increase the amount, timing, and duration of instream flows
- Floodplain reconnections and passive and active improvements in channel structure and geomorphology and the re-establishment of natural river processes
- Acquisitions of and enhancements to terrestrial uplands for wildlife habitat

These are likely to continue as the core of the program's habitat-improvement activities in the immediate future. As the program addresses instream flow, temperature, and other water-quality problems through riparian protections and water acquisitions, finding ways to relax channel constraints and allow rivers to regain more natural floodplain connections may be both the greatest habitat need and the biggest challenge in the coming decades.

g. Emerging Habitat Issues

In preparing this program, the Council received recommendations regarding a set of emerging issues only briefly addressed in the existing subbasin plans, if at all. These include:

- Increased concern over the adverse effect of non-native aquatic and terrestrial species in altered or improving habitats. This issue is addressed below, in a separate strategy.

- The need to assess and, where necessary, respond to the impacts of climate change that could threaten the program's past and ongoing investments in habitat improvements. From this point on, planning and implementation should include explicit consideration of the possible effects of climate change on the focal habitats and populations. It may be that climate change is not likely to change the suite of habitat actions that the program implements, but it may lead to a need to re-evaluate place and intensity. The Council is already investing in a set of studies and assessment methods to prepare the tools for this task, and requests federal agencies and others to do the same.

- Toxic contaminants in the rivers and streams of the Northwest may be having adverse effects on Columbia River Basin fish and wildlife mitigation and recovery. If so, identifying and reducing these toxic contaminants may be important for the success of the program. The Council encourages federal action agencies to collaborate on investigation of contaminant source identification and long-term monitoring of priority toxic contaminants with federal, regional, and state agencies to better understand how contaminants are taken up by different fish and wildlife species.

> The Council specifically encourages the long-term monitoring of known toxic contaminants including DDT, PCBs, mercury, PBDEs, PAHs, arsenic, dioxins/furans, lead, organophosphate insecticides and herbicides, copper, and estrogen compounds to establish trends in contaminant levels and locations. The results of these investigations and monitoring will assist in fish recovery efforts and will inform the Council's subbasin planning and habitat restoration efforts.

Strategies to address these emerging concerns are not likely to constitute a significant part of the program's implemented habitat activities, and the Council's program will be but one small part of the region's response to these problems. Even so, assessing the threat to the fish and wildlife important to the program and responding appropriately will be an important part of the program.

2. Non-Native Species Strategies

Non-native invasions imperil native species in the Pacific Northwest's ecosystems through predation, competition for food, interbreeding, disease transmission, food web disruption, and physical habitat alteration. Specific measures addressing the effects of non-native species on native fish, wildlife, and habitat can be found in the program's subbasin and mainstem plans along with wildlife management plans.

While the program recommends resident fish substitutions for lost salmon and steelhead where in-kind mitigation cannot occur, the program also includes a resident fish substitution strategy. The resident fish substitution strategy describes conditions under which non-native fish management should occur and requires an environmental-risk assessment[3] prior to introduction or enhancement of non-native species.

The Council supports actions that suppress non-native populations that directly or indirectly adversely affect juvenile and adult salmonids. For example, the Council urges state agencies to modify fishing regulations or harvest limits as appropriate, to reduce predation on native populations.

[3] The risk assessment process is described in Council Document ISAB 2008-4, posted at www.nwcouncil.org/fw/ISAB.

3. Artificial Production Strategies

Primary strategies: Artificial production can be used under the following conditions: 1) in an integrated manner to complement habitat improvements by supplementing native fish populations up to the sustainable carrying capacity of the habitat with fish that are as similar as possible, in genetics and behavior, to wild native fish; or 2) in a segregated manner to maintain the genetic integrity of the local populations in order to expand natural production while supporting harvest of artificially produced stocks; or 3) to replace lost salmon and steelhead in blocked areas.

A critical issue facing the region is whether artificial production activities can play a role in providing significant harvest opportunities throughout the basin while also protecting and rebuilding naturally spawning populations. Artificial production must be used in a manner consistent with ecologically based scientific principles for fish recovery. Fish raised in hatcheries for harvest should have a minimal impact on naturally spawning fish. Fish reared for the purpose of supplementing the recovery of a wild population should clearly benefit that population.

The science on this issue is far from settled. The Council will consider standards for maintaining both integrated and segregated hatchery programs, and standards for the proportion of wild fish returning to spawn that are necessary to maintain the genetic integrity of local populations, based on the recommendations from the Hatchery Scientific Review Group, due in December, 2008.

Improperly run, artificial production programs can damage wild fish runs. However, when fish runs fall to extremely low levels, artificial production may be the only way to keep enough of those populations alive in the short term so that they have a chance of recovering in the long term. What is not so clear is the extent to which artificially produced fish can be mixed with a wild population in a way that sustains and rebuilds the wild population.

The Council has weighed these uncertainties and, recognizing that inaction also poses a large risk, has adopted the following strategies:

a. Implementation of Recommendations from Artificial Production Review

In 2004, the Council and the region's fish and wildlife managers completed a multiyear review of artificial production in the Columbia River Basin. This review established a set of standards to be applied in all artificial production programs in the Columbia River Basin. This program incorporates those standards as minimum standards for all artificial production projects. The standards can be summarized as follows:

- The purpose and use of artificial production must be considered in the context of the ecological environment in which it will be used.

- Artificial production must be implemented within an experimental, adaptive-management design that includes an aggressive program to evaluate the risks and benefits and address scientific uncertainties.

- Hatcheries must be operated in a manner that recognizes that they exist within ecological systems whose behavior is constrained by larger-scale basin, regional and global factors.

- A diversity of life history types and species needs to be maintained in order to sustain a system of populations in the face of environmental variation.

- Naturally selected populations should provide the model for successful artificially reared populations, in regard to population structure, mating protocol, behavior, growth, morphology, nutrient cycling, and other biological characteristics.

- The entities authorizing or managing an artificial production facility or program should explicitly identify whether the artificial propagation product is intended for the purpose of augmentation, mitigation, restoration, preservation, research, or some combination of those purposes for each population of fish addressed.

- Decisions on the use of the artificial production tool need to be made in the context of deciding on fish and wildlife goals, objectives, and strategies at the subbasin and province levels.

- Appropriate risk management needs to be maintained in using the tool of artificial propagation.

- Production for harvest is a legitimate management objective of artificial production, but to minimize adverse impacts on natural populations associated with harvest management of artificially produced populations, harvest rates and practices must be dictated by the requirements to sustain naturally spawning populations.

- Federal and other legal mandates and obligations for fish protection, mitigation, and enhancement must be fully addressed.

b. Wild Salmon Protection

Where the critical habitat is largely intact, artificial production is not currently occurring, and the fish population has good potential, no artificial production should be used. Those populations and their associated spawning and early rearing habitat should be preserved and protected.

c. Harvest Hatcheries

Hatcheries intended solely to produce fish for harvest may be used to create a replacement for lost or diminished harvest. Hatcheries must be located and operated in a manner that does not lead to adverse effects on other stocks through excessive straying or excessive take of weak stocks in a mixed-stock fishery.

d. Restoration

Except for areas protected for wild salmon or areas where the habitat is blocked or eliminated, supplementation of natural runs with artificially produced fish may be used for the purpose of rebuilding the natural runs. However, the decision of whether to employ supplementation for this purpose is one that should be made locally, consistent with the subbasin plan. The purpose of such supplementation is to restore and maintain healthy fish populations with sufficient genetic and life history diversity to ensure that eventually, after appropriate habitat improvements, they will become self-sustaining.

e. Experimental Approach

In recognition of the risk and uncertainty associated with artificial production, each artificial production activity must be approached experimentally with a plan detailing the purpose and method of operation, the relationship to other elements of the subbasin plan, including associated habitat and other projects within the subbasin plan, specific measurable objectives for the activity, and a regular cycle of evaluation and reporting of results. This approach will allow the region to address the remaining uncertainties on a case-by-case basis and quickly make adjustments in artificial production activities where warranted.

f. Review of Hatchery and Wild Stocks

Congress initiated the Columbia River Hatchery Reform Project in 2006. Part of that project is a Hatchery Scientific Review Group (HSRG) established to review hatchery and wild stocks in the basin to determine ways to improve management practices in order to meet conservation goals while providing for sustainable fisheries. The review process encompasses all anadromous hatchery programs in the Columbia River Basin. The HSRG is scheduled to make recommendations on changes necessary in hatchery and harvest practices consistent with regional conservation and harvest goals in December 2008. The HSRG's

recommendations will include standards for maintaining both integrated and segregated hatchery programs, including standards to indicate the proportion of wild fish returning to spawn that are necessary to maintain the genetic integrity of local populations. The Council will consider adoption of the HSRG recommendations into the program when completed.

4. Harvest Strategies

Primary strategy: Ensure subbasin plans are consistent with harvest management practices and increase opportunities for harvest wherever feasible.

The Council makes no claim to regulatory authority over fish and wildlife harvest. The Council recognizes and affirms fish and wildlife managers' legal jurisdiction and tribal trust and treaty rights. However, there is little point in recommending funding for implementation of a subbasin plan when the objectives for the plan cannot be reached under current harvest regimes. If, for example, a wildlife mitigation project aims to re-establish an elk herd in a subbasin and existing regulations allow for overly aggressive harvest of the herd while it is first being established, there is good reason to doubt that the project will succeed. On the other hand, there is no advantage to increasing fish populations in the interest of greater harvest if the anticipated harvest regimes will not allow that harvest to take place. A hatchery that rears fish solely for harvest is of little benefit if the majority of those fish go uncaught because the potential harvest is restricted by the presence of another, much weaker stock.

Therefore, the Council adopts the following harvest strategies:

a. Consider Adopting HSRG Recommendations

The HSRG is scheduled to make recommendations on changes necessary in hatchery and harvest practices consistent with regional conservation and harvest goals. The Council will consider adopting the HSRG recommendations into the program when completed.

b. Artificial Production

Artificially produced fish created for harvest should not be produced unless they can be effectively harvested in a fishery or provide other significant benefits. The appropriate response to artificial production programs that do not meet this strategy is termination or revision so that the program complies with this strategy.

c. Monitoring and Reporting

The Council recommends the following practices in harvest management, and encourages the region's fish and wildlife managers to adopt them:

- Encourage an open and public process, and provide timely dissemination of harvest-related information in a publicly- accessible manner.

- Integrate harvest management to ensure conservation efforts made in one fishery can be passed through subsequent fisheries.

- Manage harvest to ensure that risk of imprecision and error in predicted run size does not threaten the survival and recovery of naturally spawning populations.

- Monitor inriver and ocean fisheries and routinely estimate stock composition and stock-specific abundance, escapement, catch, and age distribution. Expand monitoring programs as necessary to reduce critical uncertainties. Manage data so that it can be easily integrated and readily available in real time.

- Manage harvest consistent with the protection and recovery of naturally spawning populations.

- Encourage scientific peer review of harvest management plans and analyses to assess compatibility with strategies and objectives in this program.

5. Hydrosystem Passage and Operations Strategies

Primary strategies: Provide conditions within the hydrosystem for adult and juvenile fish that 1) most closely approximate the natural physical and biological conditions; 2) provide adequate levels of survival to support fish population recovery based in subbasin plans; 3) support expression of life history diversity; and 4) ensure flow and spill operations are optimized to produce the greatest biological benefits with the least-adverse effects on resident fish while assuring an adequate, efficient, economical, and reliable power supply.[4]

[4] The hydrosystem passage and operations strategies are presented in more detail in Section VI.

6. Wildlife Strategies

Primary strategy: Complete the current mitigation program for construction and inundation losses and include wildlife mitigation for all operational losses as an integrated part of habitat protection and restoration.

The program established wildlife loss assessments due to hydrosystem construction and inundation. See Table 11-4[5] in the Appendix. The Council expects the fish and wildlife managers and Bonneville to use this table as the starting point for wildlife mitigation measures as well as long-term mitigation agreements. The program also directs these parties to reach agreement on how wildlife mitigation projects and fish mitigation projects should be credited toward identified losses.

A portion of the habitat units identified in Table 11-4 have been acquired in wildlife mitigation projects to date, and some mitigation project agreements establish the basis on which the project will be credited toward these losses. However, no agreement has been reached on the full extent of wildlife losses due to the operations of the hydrosystem, nor has there been agreement on how to credit wildlife benefits resulting from riparian habitat improvements undertaken to benefit fish.

The extent of the wildlife mitigation is of particular importance to agencies and tribes in the "blocked" areas, where anadromous fish runs have been extirpated by development of the hydrosystem, and where full mitigation cannot be accomplished through resident fish substitution alone. Given the vision of this program, the strong scientific case for a more comprehensive, ecosystem-based approach, and the shift in focus to implementation through subbasin plans, the Council believes that the wildlife mitigation projects should be integrated with the fish mitigation projects as much as possible.

The Council adopts the following wildlife strategies:

a. Completion of Current Mitigation Program

Bonneville and the fish and wildlife managers should complete mitigation agreements for the remaining habitat units identified in Table 11-4 representing the unannualized losses of wildlife habitat from construction and inundation of the federal hydropower system. Bonneville and the fish and wildlife managers should develop agreements by 2011 and report back to the Council on progress. In addition, for each wildlife agreement that does not already provide for long-term maintenance of the habitat, Bonneville and the applicable management agency shall propose a

[5] This table originally appears in the Council's 1994-1995 Fish and Wildlife Program and has been part of every program since.

management plan adequate to sustain the minimum credited habitat values for the life of the project.

Beginning in the 2000 Program, the Council called for these mitigation agreements to equal 200 percent of the remaining habitat units (2:1 ratio). The Council chose the 2:1 crediting ratio to address the inability to precisely determine the habitat units resulting from acquiring an interest in property that already has wildlife value or the additional losses represented by annualization of the losses. The Council adopted and continues to endorse the 2:1 crediting ratio for the remaining habitat units. The ratio only applies when loss estimates are not inaccurate due to stacking.

The Council recognizes that controversy over the program's crediting ratio continues. The managers and Bonneville have not reached agreement on how to credit wildlife benefits resulting from riparian habitat improvements undertaken to benefit fish nor have they reached agreement on the full extent of wildlife losses resulting from operation of the hydrosystem. The Council will work with Bonneville and the managers to address these and other issues associated with loss assessments and crediting and to develop a comprehensive agreement on the proper crediting ratio(s) or strategies that will allow the parties to reach long-term settlement agreements. This shall be completed within one year of adoption of the amended program. Once a comprehensive agreement has been reached, the Council will consider adopting it into the program.

Whenever possible, wildlife mitigation should take place through long-term agreements that have clear objectives, a plan for action over time, a committed level of funding that provides a substantial likelihood of achieving and sustaining the stated wildlife mitigation objectives, and provisions to ensure effective implementation with periodic monitoring and evaluation. Thus, wildlife mitigation agreements should include the following elements:

- Measurable objectives, including acres of habitat types and number of habitat units by species to be acquired, and a statement estimating the contribution to addressing the wildlife losses identified in Table 11-4 in the Appendix;

- Demonstration of consistency with the wildlife policies, objectives and strategies in the Council's program, including with the implementation priorities described in Tables 11-1, 11-2 and 11-3 in the Appendix;

- When possible, protection for riparian habitat that can benefit both fish and wildlife, and protect high-quality native habitat and species of special concern, including endangered, threatened, or sensitive species;

- Incentives to ensure effective implementation of the agreement, plan or action, with periodic monitoring and evaluation (including a periodic audit) and reporting of results. At a minimum, annual reports to Pisces[6] must continue in order for the Council to evaluate the mitigation benefits;

- Provisions for long-term maintenance of the habitat adequate to sustain the minimum credited habitat values for the life of the project; and

- Sufficient funding to demonstrate a substantial likelihood of achieving and sustaining the wildlife mitigation objectives.

b. Habitat Units and the Habitat Evaluation Procedure (HEP) Methodology

The Council continues to endorse habitat units as the preferred unit of measurement for mitigation accounting and the Habitat Evaluation Procedure (HEP) methodology as the preferred method for estimating habitat units lost and acquired. Parties to a wildlife mitigation agreement may develop and use another method for evaluating potential mitigation actions if, in the Council's opinion, that alternative method adequately takes into account both habitat quantity and quality adequate to mitigate for the identified losses.

c. Allocation of Habitat Units

Habitat acquired as mitigation for lost habitat units identified in Table 11-4 must be acquired in the subbasin in which the lost units were located unless otherwise agreed by the fish and wildlife agencies and tribes in that subbasin.

d. Habitat Enhancement Credits

Habitat enhancement credits should be provided to Bonneville when habitat management activities funded by Bonneville lead to a net increase in habitat value when compared to the level identified in the baseline habitat inventory and subsequent habitat inventories. This determination should be made through the periodic monitoring of the project site using the Habitat Evaluation Procedure (HEP) methodology. Bonneville should be credited for habitat enhancement efforts at a ratio of one habitat unit credited for every habitat unit gained.

[6] BPA created Pisces, a web-enabled software tool, to manage fish and wildlife projects within the Fish and Wildlife Program. Pisces provides an environment where contractors and project managers can create and manage projects. Pisces also provides access to reports on all aspects of the program's activity.

e. Operational Losses

As part of the programmatic evaluation of the wildlife program described below, the Council will consult with the wildlife managers and Bonneville on the value of committing program resources at this time to assessing direct operational impacts on wildlife habitat. Operations loss assessment work under way in the Kootenai Subbasin in 2008 may serve as a pilot project for this evaluation. The wildlife managers and Bonneville should also consider using mitigation agreements to settle operational losses in lieu of precise assessments of impacts. Revised subbasin plans will serve as the vehicles to provide mitigation for any identified direct operational losses and for secondary losses to wildlife due to declines in fish populations resulting from hydropower development. Annualization will not be used in determining the mitigation due for these losses. However, where operational or secondary losses already have been addressed in an existing wildlife mitigation agreement, the terms of that agreement will apply.

f. Mitigation Crediting Forum

In consultation with the wildlife managers, Bonneville, and other interested parties, the Council will establish a Wildlife Mitigation Crediting Forum. The purpose of the Crediting Forum will be to establish a commonly accepted ledger of habitat units acquired and to recommend ways to resolve issues about accounting for habitat units. The Crediting Forum will develop a common data base for tracking, assigning and recording habitat units.

g. Implementation Guidelines

Project selection will be guided by subbasin plans incorporating wildlife focal species and management strategies. The subbasin plans will reflect the current basinwide vision, biological objectives and strategies and also will outline more specific short-term objectives and strategies for achieving specific wildlife mitigation goals. The plans will act as work plans for the fish and wildlife managers and tribes, with an emphasis on fully mitigating the construction and inundation and direct operational losses by a time certain, and will be revisited regularly as part of the provincial project review cycle. Mitigation programs should provide protection of habitat through fee-title acquisition, conservation easement, lease, or other management strategies in management plans that provide for the protection of the habitat units for the life of the project.

7. Resident Fish Substitution Strategies

Primary Strategy: Resident fish substitution is an appropriate mitigation strategy in areas blocked to salmon and steelhead by the development and operation of the hydropower system. Flexibility in approach is needed to develop a program that provides resident fish substitutions for lost salmon and steelhead where in-kind mitigation cannot occur.

All proposals for ongoing or new resident fish substitution projects that involve or might involve a non-native species must include a comprehensive Environmental Risk Assessment of potential negative impacts on native fish species. The Independent Scientific Advisory Board recommended a template for such an environmental risk assessment.[7] Starting with that template, the Council will work with the Independent Scientific Review Panel and the appropriate fish and wildlife agencies and tribes to develop the final Environmental Risk Assessment template.

[7] *Non-native Species Impacts on Native Salmonids in the Columbia River Basin, Including Recommendations for Evaluating the Use of Non-Native Fish Species in Resident Fish Substitution Projects*, Council Document ISAB 2008-04 (posted at www.nwcouncil/org/fw/isab/).

8. Monitoring, Evaluation, Research and Reporting Strategies

Primary strategies: 1) Identify priority fish, wildlife and ecosystem elements of the program that can be monitored in a cost effective manner, evaluate the monitoring data and adaptively manage the program based on results; 2) research and report on key uncertainties; 3) make information from this program available; and 4) to the extent practicable ensure consistency with other processes.

An important element of the fish and wildlife program is to identify measures to improve conditions for fish and wildlife. A large body of anadromous fish data but considerably less resident fish and wildlife data inform the development and implementation of these measures. Some of this information is collected through processes that do not receive funding through the fish and wildlife program but are available to the program to help inform decision-making.

Focusing on the program's biological and ecosystem priorities, a monitoring program should be designed to be efficiently distributed in an integrated, cost-effective manner. The program should identify priority data gaps to acquire new data. Additionally, every effort should be made to eliminate or consolidate redundant monitoring and evaluation efforts. The Council intends that the region gather sufficient information to make good choices among possible measures and projects implementing those measures and the monitoring efforts be integrated with relevant biological opinions, recovery plans and other guidance.

Monitoring and evaluation has several purposes: 1) tracking the implementation of measures; 2) tracking the status and trends of priority focal species and their limiting factors in priority areas; and 3) determining the effectiveness of projects carried out under this program.

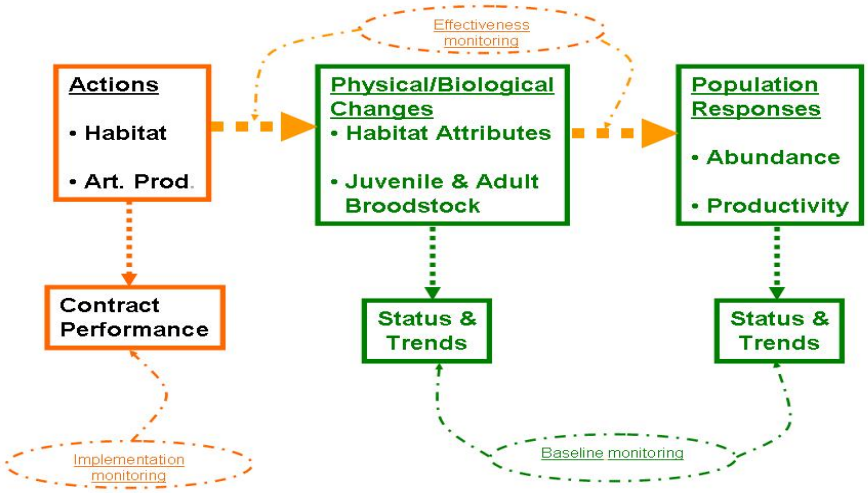

Figure 1. This figure shows how projects carried out for the purposes of achieving status and trend responses work with the various types of monitoring.

Biological and ecosystem responses to projects are often small and difficult to detect when compared to the variability of natural systems. Monitoring and evaluation designs should be developed to achieve the highest level of certainty or confidence with respect to outcomes. However, the Council recognizes that tradeoffs will need to be considered when it comes to developing the best monitoring and evaluation design and cost balance. This may mean establishing a lower level of confidence with respect to the size and scope of monitoring and evaluation designs instead of the 95 percent level of certainty traditionally pursued by investigators. In some instances, measuring individual project effectiveness suffices. In other cases, monitoring the bulk effectiveness of a suite of projects is appropriate.

a. Identify Monitoring and Evaluation Needs

Guidelines for collecting and evaluating data: The Council will involve all interested parties in the region to establish and periodically adjust guidelines for monitoring and evaluation efforts coordinated through the program. The Council intends to use monitoring primarily to track progress and to adaptively manage the implementation of priority projects as identified through an effective evaluation program.

Standards for monitoring: Monitoring and evaluation activities proposed for funding under this program should satisfy the following criteria:

- All implementation projects under this program will have some level of monitoring and evaluation and must have a clear linkage to

the appropriate program or subbasin goals, limiting factors, priority reaches, and focal species.

- Monitoring efforts must collect or identify nearby data that are appropriate for tracking focal species and ecosystem variables and, through evaluations, determine the effectiveness of projects in meeting their intended purpose. To the extent practicable, monitoring activities will be designed to represent entire populations, subbasin-scale ecosystem functions or the effectiveness of suites of projects.

- The methods and protocols used in data collection and evaluation must be consistent with guidelines approved by the Council. Periodically, the Council will adopt or update relevant monitoring and evaluation methods and protocols.

- Monitoring and evaluation projects should identify effective and efficient monitoring and evaluation tasks related to the objectives, identify who will do the monitoring and reporting and on what schedule, incorporate independent review, and provide a budget for the monitoring and evaluation work.

- All monitoring and evaluation funded under this program must be made readily available to all interested parties. This includes abstracts and information about how to obtain the full text of reports and data. Monitoring and evaluation project managers are required to submit annual progress reports containing environmental, fish, and wildlife data gathered within the previous year.

b. Research

The Council will identify research priorities to resolve critical ecosystem or biological uncertainties. Research will focus on those areas where, in a reasonable amount of time, results could be generated or tools developed to better inform management decisions and to more efficiently expend program resources.

- **Research plan:** The Council will update its research plan, which identifies major research topics and establishes priorities for research funding.

- **Coordination:** The research plan will be updated in an open manner designed to ensure independent scientific review, input from fish and wildlife agencies and tribes, independent scientists, federal agencies, and other interested parties in the region.

- **Open access to results:** All research funded under this program must be made readily available to all interested parties. This includes abstracts and information about how to obtain the full text of reports and data. Research project managers will submit annual progress reports containing environmental, fish, and wildlife data gathered within the previous year. Research managers also will complete a report of all relevant information and research results including full reports and abstracts within six months after conducting each significant phase of a research project.

- **"Science and Policy" exchanges:** Approximately every two years the Council will co-sponsor a Columbia River science and policy conference to discuss scientific developments in policy key areas. The Council will work with the Independent Scientific Advisory Board to identify the agenda. After each exchange a summary report with implementation recommendations will be produced and posted to the Council's website. This information will be used to update the research plan.

c. Reporting and Data Management

Data management strategies support monitoring, evaluation, and research actions and provide the means for making information and results easily available through publicly accessible Internet sites.

There are several reporting outcomes of the Council's, monitoring, evaluation and research program: High-level indicators, information, project reporting, data gap analysis, efficiency estimates, cost accounting, and research. Each component serves a different purpose but together they provide important information necessary to determine whether actions implemented through the program are benefiting fish and wildlife populations.

- **High-Level Indicators:** The Council will adopt and periodically update high-level indicators for the purpose of reporting success and accomplishments to Congress, the region's governors, legislators and to the citizens of the Northwest. High level indicators will include biological, implementation, and management components.

- **Reporting metrics and protocols:** The Council will adopt and periodically update a set of reporting metrics and protocols for the purpose of tracking the accomplishments of individual and multiple projects. These implementation metrics will vary according to the type of project (wildlife operations and maintenance costs, fencing for riparian protection, hatchery production, etc.) and should accurately represent accomplishments. The Council will also develop and adopt protocols to monitor status and trends of fish populations as well as to

assess environmental conditions. Bonneville should ensure that the Council metrics and protocols are included in project contracts and incorporated into Bonneville-supported databases.

- **Annual report:** Program implementation must include a systemwide annual report that describes whether the individual projects in the subbasins are achieving the objectives of the program. The report will describe the program's focus on priority limiting factors and focal species in priority areas and any adaptations necessary to address these factors. This report also will summarize the status and trends of key species and ecosystem parameters. The Council will work with all interested parties in the basin to design this annual reporting process and associated monitoring program, including describing the evaluation tasks and the use of the independent science panels in assisting with this evaluation effort.

- **Data management:** Data sets and accompanying metadata sets associated with monitoring, evaluation and research actions conducted through the Council's fish and wildlife program must remain available to the region in an agreed upon electronic format. Data and reports developed with Bonneville funds should be considered in the public domain. Data and metadata must be compiled, analyzed and reported annually and within six months of the completion of the project.

- **Data gaps and redundancies:** Through reports and analyses, developed in collaboration with others in the Columbia River Basin, the Council will continue to identify data needs, survey available data, reduce redundancies, and fill high-priority data gaps. Particular attention will be given to finding ways to effectively and efficiently use ecosystem, fish, and wildlife data gathered by others for purposes other than meeting the needs of this program.

- **Dissemination of data via the Internet:** Efficient data management combined with simple, easy access to the data is essential to allow effective reporting. The Council will collaborate with others to establish an integrated Internet-based system for the efficient dissemination of data relevant to this fish and wildlife program. Data sites must be adaptively managed to stay current with the evolving needs of data users in the Columbia River Basin.

Bonneville, in its contracting process, should ensure that monitoring activities adhere to the relevant protocols and methods that satisfy these reporting and data management criteria.

d. Consistency with Other Processes and Products

The Council's monitoring, evaluation, research, data management, and reporting effort will be coordinated with similar efforts described in relevant biological opinions and recovery plans for the Columbia River Basin. Efficiencies that may come from integrating these efforts with the Council's program will be identified and implemented where practical.

III. Ecological Provinces

The Council adopted an ecologically based structure for the basin that emphasizes the interrelationships of the parts. The program organizes the Columbia River Basin into 11 ecological provinces -- groups of adjoining subbasins with similar climates and geology. The provinces' physical similarities are largely reflected in biological populations located within the provinces. Populations within a province are more likely to be related to other populations within that province than to populations in other provinces because life history and other biological characteristics often reflect physical habitat structure. Thus, provinces are appropriate units around which to organize and evaluate mitigation and recovery efforts.

For purposes of the program, a subbasin can only be in one province. Based on patterns of terrestrial vegetation, the headwaters of a subbasin are often distinct from the lower reaches. However, for purposes of planning, it makes little sense to split subbasins. Instead, the program treats each subbasin as an integral component of a set of related subbasins that form a province. Hydroelectric dams, including the major dams on the Columbia and Snake rivers, also are considered to be within provinces.

Figure 2. Columbia River Basin Fish and Wildlife Program Provinces and Subbasins

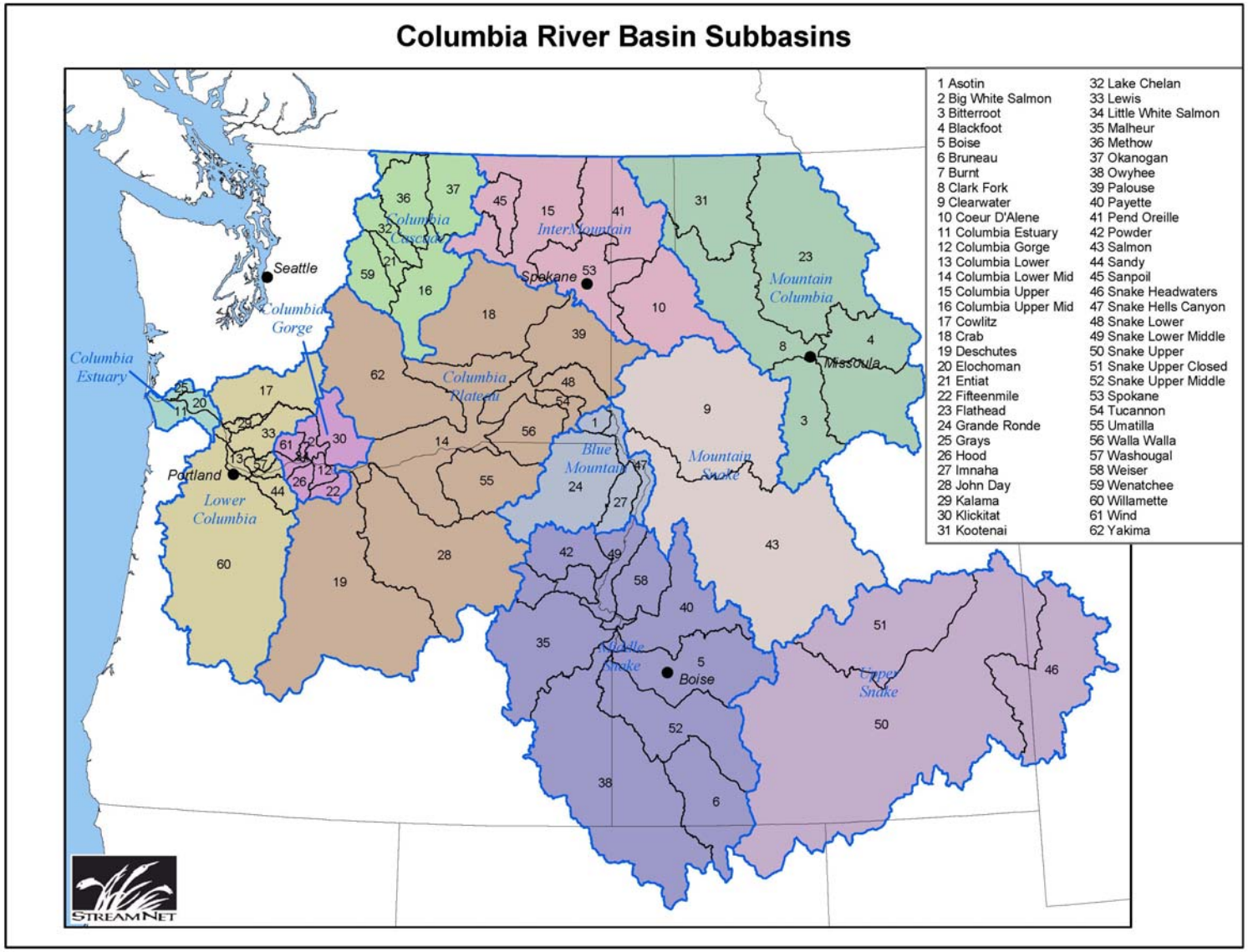

Figure 3. Columbia River Basin Including Canada

Table 1.

Geographic Structure of the Columbia River Ecosystem Excluding the Marine Landscape

Landscape	Province	Subbasin
Columbia River Basin	Columbia River Estuary	- Elochoman - Grays - Columbia Estuary (Columbia River and all other tributaries from the ocean upstream to the confluence with the Cowlitz River
	Lower Columbia	- Cowlitz - Kalama - Lewis - Sandy - Washougal - Willamette - Columbia Lower (Columbia River and all other tributaries upstream of the Cowlitz to, but not including, Bonneville Dam)
	Columbia Gorge	- Big White Salmon - Fifteenmile - Hood - Klickitat - Little White Salmon - Wind - Columbia Gorge (Columbia River and all other tributaries between, and including Bonneville and The Dalles dams)
	Columbia Plateau	- Crab - Deschutes - John Day - Palouse - Tucannon - Umatilla - Walla Walla - Yakima - Columbia Lower Middle (Columbia River and all other tributaries upstream of The Dalles up to and including Wanapum Dam) - Snake Lower (Snake River and all other tributaries between the confluence with the Columbia river and the confluence with the Clearwater River)
	Columbia Cascade	- Entiat - Lake Chelan - Methow - Okanogan - Wenatchee - Columbia Upper Middle (Columbia River and all other tributaries upstream of Wanapum Dam to, but not including, chief Joseph Dam)
	Intermountain	- Coeur d' Alene, including Coeur d'Alene Lake - Pend Oreille - San Poil - Spokane - Columbia Upper (Columbia River and all other tributaries from Chief Joseph Dam to the international border)
	Mountain Columbia	- Bitterroot - Blackfoot - Clark Fork - Flathead - Kootenai
	Blue Mountain	- Asotin - Grande Ronde - Imnaha - Snake Hells Canyon (Snake River and all other tributaries upstream of the confluence with the Clearwater River to, and including, Hells Canyon Dam)
	Mountain Snake	- Clearwater - Salmon
	Middle Snake	- Boise - Bruneau - Burnt - Malheur - Owyhee - Payette - Powder - Weiser - Snake Lower Middle (Snake River and all other tributaries upstream of Hells Canyon Dam to the confluence with the Boise River) - Snake Upper Middle (Snake River and all other tributaries from the confluence with the Boise River upstream to the confluence with Clover Creek near the town of King Hill)
	Upper Snake	- Upper Snake (Snake River and tributaries from Clover Creek upstream to the headwaters of the Henry's Fork) - Upper Closed Basin - Headwaters of the Snake (Snake River and all tributaries from the Heise gauging station upstream to the headwaters in Wyoming)

IV. Ocean

Primary strategy: Identify the effects of ocean conditions on anadromous fish survival and use this information to evaluate and adjust inland actions.

The Council considers the ocean environment an integral component of the Columbia River ecosystem. Freshwater and marine environments are not independent from one another. They are linked via large-scale atmospheric and oceanographic processes. The Council recognizes the importance of ocean conditions to salmonid survival and to the management and conservation of Columbia River Basin salmon and steelhead populations.

The ocean is not a constant environment. Variations in ocean conditions can occur over relatively short time periods measured in years as well as over longer cycles measured in decades. As a result of the varying ocean conditions, salmon populations are constantly fluctuating and may pass through decade-long cycles of abundance, followed by equally long cycles of scarcity.

While we cannot control the ocean itself, we can monitor ocean conditions and related salmon survival and take actions to improve the likelihood that Columbia River Basin salmon can survive varying ocean conditions. A better understanding of the conditions salmon face in the ocean can suggest which factors will be most critical to survival, and thus provide data as to which actions taken inland will provide the greatest benefit.

An accurate and timely understanding of ocean survival of each of the Columbia River Basin stocks also helps the Council assess the value of measures undertaken in this program. Because the ultimate measure of success is the number of adult fish returning, accurate monitoring and evaluation of inland efforts depends on the ability to isolate the effects of the ocean on a stock from the effects of inland actions. Without the ability to distinguish ocean effects from other effects, the Council may be tempted to correlate large salmon returns with successful mitigation practices. Likewise, poor returns of adult fish may lead the Council to abandon mitigation actions that are highly beneficial but which are overshadowed by the effects of poor ocean conditions unless the Council can determine the poor returns are in spite of, and not because of, the mitigation actions.

A. Ocean Strategies

The Council adopts the following strategies for the freshwater plume, the near-shore ocean, and the high seas:

1. Manage for Variability

Variations in ocean conditions and regional climate play a large role in the survival of anadromous fish and other species in the Columbia River Basin. Management actions should strive to help those species accommodate a variety of ocean conditions by providing a wide range of life history strategies. The Council

supports continued monitoring and evaluation of the Columbia River plume and ocean conditions for impacts on salmonid survival. The Council also supports monitoring salmon returns and climate change impacts on ocean conditions in order to identify factors affecting survival in the ocean and plume.

2. Distinguish Ocean Effects from Other Effects

Monitoring and evaluation actions should recognize and take into account the effect of varying ocean conditions and, to the extent feasible, separate the effects of ocean-related mortality from that caused in the freshwater part of the life cycle.

V. The Columbia River Estuary

The Columbia River estuary is an important ecological feature that is negatively affected by upriver actions and local habitat change. The storage, release, and impoundment of water changes the pattern of water flows and water temperatures below the hydroelectric dams and changes the characteristics of the estuary. While less is known about the potential for improvements in salmonid survival in the estuary and lower Columbia River than is known about the potential for improvement in other parts of the Columbia River Basin, recent scientific evidence points to the potential for substantial survival improvements that may benefit most anadromous fish populations. In 2008, science suggests that survival improvements for habitat actions taken in the Columbia River Estuary have the potential to improve survival benefits for fall Chinook salmon by 9 percent and spring Chinook, sockeye, and steelhead by 6 percent, a survival improvement possibly unequaled by tributary habitat actions.

Specific implementation of habitat and monitoring and evaluation actions in the estuary will occur through the adopted estuary and Lower Columbia subbasin plans. The recently completed *Columbia River Estuary ESA Recovery Plan Module for Salmon and Steelhead* also will help guide actions in the estuary and lower Columbia River.

A. Estuary Strategies

The Council supports strategies that protect, enhance, and restore critical habitat and spawning and rearing grounds in the estuary and lower Columbia River. Such strategies may include:

- Habitat restoration work to reconnect ecosystem functions such as removal or lowering of dikes and levees that block access to habitat or installation of fish-friendly tide gates;
- Long-term effectiveness monitoring for various types of habitat restoration projects in the estuary;
- Continued evaluation of salmon and steelhead migration and survival rates through the mainstem hydropower dams, the lower Columbia River, the estuary, and the marine environment;
- Evaluation of the impact of flow regulation, dredging, and water quality on estuary-area habitat to better understand the relationship between estuary ecology and near-shore plume characteristics and salmon and steelhead productivity, abundance, and diversity;
- Recognition and encouragement of continued partnerships in planning, monitoring, evaluating, and implementing activities in the estuary and lower Columbia River.

VI. Mainstem Plan

The Mainstem Plan is a coordinated plan of operations, habitat improvements, and monitoring and evaluation for the mainstem Columbia and Snake rivers. It contains specific objectives and action measures for the federal operating agencies and others to implement in the mainstem Columbia and Snake rivers to protect, mitigate and enhance fish and wildlife affected by the development and operation of hydroelectric facilities. It does so consistent with the basinwide vision, objectives and strategies and the underlying scientific foundation, while assuring the region an adequate, efficient, economical and reliable power supply. The mainstem plan includes objectives and measures relating to:

- the protection and enhancement of mainstem habitat, including spawning, rearing, resting and migration areas for salmon and steelhead and resident salmonids and other fish;
- system water management;
- passage spill at mainstem dams;
- adult and juvenile passage modifications at mainstem dams;
- juvenile fish transportation;
- adult survival during upstream migration through the mainstem;
- reservoir elevations and operational requirements to protect resident fish and wildlife;
- water quality conditions; and
- research, monitoring and evaluation.

A. The Context for the Mainstem Plan

At one time the Council's fish and wildlife program included detailed hydrosystem operations for fish and wildlife. This is no longer necessary. The federal agencies that manage, operate and regulate the federal dams on the Columbia and Snake rivers now have detailed plans for system operations and for each hydroelectric facility intended to improve conditions for fish and wildlife affected by the hydrosystem. These federal agency plans are described and reviewed largely in biological opinions issued by NOAA Fisheries (formerly the National Marine Fisheries Service) and the U.S. Fish and Wildlife Service for the operation of the Federal Columbia River Power System and the Bureau of Reclamation's projects in the Upper Snake.[8]

The main focus of these federal plans is to benefit populations of salmon, steelhead, bull trout and Kootenai River white sturgeon listed as threatened or endangered under the federal Endangered Species Act (ESA). The plans also contain objectives and actions to benefit other fish and wildlife affected by the hydrosystem, consistent with the federal agencies' obligations under other authorities, including obligations to this program under the Northwest Power Act. Additional mainstem operations and actions to benefit these species are found in the Columbia River Basin Fish Accords executed by the federal agencies in 2008 with four Indian tribes and two states and described in the basinwide provisions. Finally, operators of non-federal dams on the mainstem Columbia and Snake are implementing, or will soon implement, increasingly detailed plans to benefit Columbia and Snake fish and wildlife, agreed upon through the regulatory and relicensing processes at the Federal Energy Regulatory Commission.

The hydrosystem measures in these plans and opinions contain hundreds of pages of detail and hundreds of measures on system configuration, river flows, reservoir management, passage improvements, spill, juvenile transportation, predator management and more. These measures are built on foundations developed in the Council's program over the last 28 years. In turn, the Council's Mainstem Plan is now built on recognizing these plans and biological opinions as containing the baseline objectives and measures for the mainstem portion of the Council's fish and wildlife program.

In this context, the purpose of the Mainstem Plan is:

- to set forth a systematic set of biological objectives, habitat considerations, principles and strategies to protect, mitigate and enhance all the fish and wildlife

[8] The relevant biological opinions include NOAA Fisheries, *Consultation on Remand and Biological Opinion for Operation of the Federal Columbia River Power System, 11 Bureau of Reclamation Projects in the Columbia Basin and ESA Section 10(a)(I)(A) Permit for Juvenile Fish Transportation Program* (May 2008); NOAA Fisheries, *Consultation and Biological Opinion for the Operation and Maintenance of 10 U.S. Bureau of Reclamation Projects and 2 Related Actions in the Upper Snake River Basin above Brownlee Reservoir* (May 2008); U.S. Fish and Wildlife Service, *Biological Opinion regarding the effects of Libby Dam operations on the Kootenai River White Sturgeon, Bull Trout and Kootenai Sturgeon Critical Habitat* (February 2006); U.S. Fish and Wildlife Service, *Biological Opinion: Effects to Listed Species from Operations of the Federal Columbia River Power System* (December 2000). Various ESA recovery plans and draft recovery plans across the basin incorporate these hydrosystem objectives and measures as well.

of the Columbia River Basin affected by the development, operation and management of the hydrosystem, whether listed or not;

- to recognize the objectives and measures already committed to by the federal agencies;

- to identify additional objectives and measures as necessary to protect and improve conditions for fish and wildlife in the mainstem that are not listed under the Endangered Species Act and thus not the systematic focus of the current federal and non-federal plans;

- to identify power system impacts and optimum strategies to improve both the power supply and the conditions for fish and wildlife;

- to emphasize the need for rigorous monitoring and evaluation of these measures and for public reporting and accountability; and

- to describe broader planning considerations consistent with a long-term program for protection and mitigation beyond the immediate requirements of the ESA.

B. Vision of the Mainstem Plan

The vision for the mainstem plan is consistent with the program's broader basinwide vision. Hydrosystem operations, fish passage efforts, habitat improvement investments and other actions in the mainstem should be directed toward optimizing survival through the mainstem, largely by protecting, enhancing, restoring and connecting[9] natural river processes and habitats, especially spawning, rearing, resting and migration habitats for salmon, steelhead, sturgeon and important resident fish populations. This will allow for abundant, productive and diverse fish and wildlife populations.

The vision includes providing conditions within the hydrosystem for adult and juvenile fish that: 1) most closely approximate natural physical and biological conditions; 2) support the expression of life history diversity; 3) allow for adequate levels of mainstem survival to support fish population recovery in the subbasins; and 4) ensure that water management operations are optimized to meet the needs of anadromous and resident fish species, including those in upstream storage reservoirs, with the least cost so that actions taken maximize benefits to all species while ensuring an adequate, efficient, economical and reliable power supply.

Any system changes needed to achieve these goals must be implemented in such a way and over a sufficient time period to allow the region to make whatever power system adaptations are needed, if any, to maintain an adequate, efficient, economical and reliable power supply. Actions taken under the program will also provide conditions that should meet water quality standards under the Clean Water Act.

[9] "Restore" as used in the mainstem plan means to take an action in a particular area that currently has no habitat value for spawning or rearing or other desired population condition (because, for example, the area has been blocked inundated or dewatered at an inopportune time), so that the area will have value for that purpose. It does not mean to re-establish the conditions that existed at any particular point in time, including the time before non-Indian settlement and development of the Columbia basin.

"Enhance," by contrast, when referring to habitat conditions, means to take an action in an area that currently has some value for spawning or rearing or other desired condition so as to increase that value.

"Connecting" habitat becomes important when a migrating population has areas of productive habitat that it cannot use to full advantage (or use at all) because the habitat is inaccessible to the population or because the areas in between productive habitat are not productive without improvements. It also does not mean or imply a Council position in support of the breaching of dams in the mainstem. Throughout the provisions of these mainstem amendments, the Council's position is consistent with the position of NOAA Fisheries' 2008 FCRPS Biological Opinion with reference to breaching of the federal dams on the lower Snake River or other mainstem dams.

C. Biological Objectives

1. Overarching Objectives and Priorities For the Mainstem

The biological objectives stated here for the mainstem plan are based on and consistent with the biological objectives in the basinwide provisions of the fish and wildlife program. These biological objectives and accompanying operational strategies are designed to improve the life-cycle survival of important populations of listed and unlisted salmon, steelhead, lamprey, resident fish, and wildlife. The Council's goal is to apply the available resources in the most effective way possible to achieve protection, mitigation, recovery and delisting of threatened and endangered species in the shortest possible time. This demands that the Council set clear priorities for resource expenditures to protect, mitigate, and enhance fish and wildlife populations to assure that fish and wildlife benefits are achieved at the least cost to the region's financial and water resources.

One of the overarching objectives for the program is the recovery of ESA-listed anadromous and resident fish affected by development and operation of the hydrosystem. Federal hydrosystem operations to benefit fish now are focused on listed populations through the objectives in NOAA Fisheries' 2008 Biological Opinions on the Operation of the Federal Columbia River Power System and on the Bureau of Reclamation's Upper Snake projects for salmon and steelhead and in the U.S. Fish and Wildlife Service's biological opinions in 2000 and 2006 on FCRPS operations affecting Kootenai River white sturgeon and bull trout (*see* footnote 8). Achieving the biological performance standards for listed species set forth in the biological opinions is a key biological objective of the Council's program and this mainstem plan.

Under the Northwest Power Act, however, the Council has an obligation to protect, mitigate and enhance all the fish and wildlife of the Columbia Basin affected by the development, operation and management of the hydrosystem. Concern over the listed populations is only one part of the Council's broader mandate. Therefore, a goal of the Council's program, as set forth in the program's vision statement, is to provide habitat conditions that sustain abundant, productive, and diverse fish and wildlife populations that support the recovery of listed species and abundant opportunities for tribal trust and treaty-right harvest and non-tribal harvest.

In addition, the science relating to the rebuilding of Pacific salmon indicates that success in protecting and enhancing abundant and diverse naturally spawning populations of salmon and steelhead and other native fish requires an emphasis on protecting, enhancing, connecting, and restoring habitats and populations that are relatively productive. This is a priority for actions that should be equal to protecting migration and spawning conditions for ESA-listed populations. This priority includes, for example, protecting and improving mainstem migration conditions for important non-listed tributary populations in the middle part of the

river. These include, for example, spring chinook in the John Day and Deschutes rivers. Also, historically the most productive populations in the Columbia system were those that spawned in the mainstem or the lower parts of the tributaries, as described in the basinwide habitat objectives and strategies above, and that have been either extirpated (e.g., those that spawned in the mainstem above Chief Joseph Dam or in the area now inundated by John Day Dam) or remain relatively productive (e.g., Hanford Reach fall chinook). Accordingly, this plan emphasizes protecting and restoring mainstem spawning and rearing habitats and populations. These general objectives for the mainstem are consistent with, and incorporate, the basinwide vision, biological objectives, and the habitat and hydrosystem strategies.

2. Specific Objectives and Performance Standards for Habitat Characteristics and for Population Performance

a. Mainstem habitat conditions

- Identify and protect habitat areas and ecological functions that are relatively productive for spawning, resting, rearing, and migrating salmon and steelhead in the mainstem. This includes, among other things, protecting the Hanford Reach fall chinook habitat by determining and providing appropriate spawning and rearing flows. In addition, where feasible, restore and enhance habitats and ecological functions that connect to protected productive areas to support the expansion of productive populations and to connect weaker and stronger populations, so as to restore more natural population structures.

- Protect, enhance, restore and connect freshwater habitat in the mainstem for the life history stages of naturally spawning anadromous and resident salmonids. Protect and enhance ecological connectivity between aquatic areas, riparian zones, floodplains and uplands in the mainstem.
    - Enhance the connections between the mainstem sections of the Columbia and Snake rivers and their floodplains, side channels and riparian zones.
    - Manage mainstem riparian areas to protect aquatic conditions and form a transition to floodplain terrestrial areas and side channels.
    - Identify, protect, enhance and restore the functions of alluvial river reaches in the mainstem.
    - Where feasible, reconnect protected and enhanced tributary habitats to protected and enhanced mainstem habitats, especially in the area of productive mainstem populations.

- Allow for biological diversity to increase among and within populations and species to increase ecological resilience to environmental variability.
    - Expand the complexity and range of mainstem habitats to allow for greater life history and species diversity.
    - Manage human activities in the mainstem, such as fish passage at mainstem dams, fish transportation and harvest, to minimize artificial selection or limitation of life history traits.

- Increase the amount of spawning habitat for fall chinook core populations in the lower and mid-Columbia area and in the lower Snake area.

- Where feasible, manage the hydrosystem to optimize survival, including by reestablishing patterns of flow that more closely approximate natural hydrographic patterns. Ensure that any changes in water management are premised upon, and proportionate to, scientifically demonstrated fish and wildlife benefits. Examples of management actions or limitations consistent with this objective include:
    - Attempt to provide natural spring freshets below the storage projects, within flood control constraints.
    - Minimize fluctuations in flows out of the storage reservoirs over an extended period of the summer and fall. To the extent this conflicts with use of the hydrosystem for load following, system operators should balance equitably the biological requirements of fish with power supply requirements of the region.
    - Apply rules of operation for all the storage projects, such as the Integrated Rule Curves developed by the Montana Department of Fish, Wildlife and Parks for Libby and Hungry Horse dams, so that drawdown and refill are based substantially on local inflows, and so that the reservoirs, in concert, can shape water releases to benefit fish in and immediately below reservoirs and then, as the water travels downstream, benefit anadromous fish.
    - Operations based solely on efforts to achieve biological opinion flow targets in the lower Columbia river adversely affect resident fish and may fail to benefit anadromous fish if they do not take into account reasonable storage project operations.
    - Operations should meet the requirements of both resident and anadromous fish.
    - The amount of flow augmentation and the release schedule from storage reservoirs should be based on the best available science for each target species (resident or anadromous) and weighted for the greatest benefit to all species.

- Identify, protect, enhance, restore, and connect ecosystem functions in the Columbia River estuary and nearshore ocean discharge plume as affected by actions within the Columbia River mainstem. Evaluate flow regulation and changes to estuary-area habitat and biological diversity to better understand the relationship between estuary ecology and near-shore plume characteristics and the productivity, abundance, and diversity of salmon and steelhead populations.

- Where feasible, pursue restoration of anadromous fish in mainstem areas blocked by dams. Where this is not feasible, other measures will be used to protect, mitigate, and enhance related habitat and species

assemblages. Under Section 4(h)(11)(A)(ii) of the Northwest Power Act, the Federal Energy Regulatory Commission has an obligation to take the Council's program, including this provision, into account at each relevant stage of decision-making to the fullest extent practicable as it exercises its responsibilities. This includes decisions on whether to license or re-license a non-federal hydroproject on the Columbia and Snake mainstem. If, after fulfilling this legal obligation, FERC decides not to require reintroduction of anadromous fish into an area blocked by a particular hydroproject, actions to enhance habitat and species assemblages that exist above the blockages should be used in mitigation.

b. Migration and passage conditions for anadromous fish

- Improve the survival and production of anadromous fish in the mainstem by enhancing the inriver migration, habitat, and water-quality conditions consistent with the biological objectives of this program and with the efforts to meet ESA requirements in the FCRPS Biological Opinion and state and federal water-quality standards under the Clean Water Act.

- The NOAA Fisheries 2008 FCRPS Biological Opinion includes hydrosystem survival performance standards for inriver passage of affected life stages of ESA-listed salmon and steelhead through the eight federal dams in the lower Columbia and lower Snake rivers. The program adopts these objectives. Achieve these objectives at the minimum economic cost.

- The Council will consult with state and federal fish and wildlife agencies and tribes, the Independent Scientific Advisory Board, and federal operating agencies to determine the possibility of adopting hydrosystem survival performance standards for non-listed populations of anadromous fish, including lamprey. On an interim basis, the project-by-project survival performance standards also apply for inriver passage of non-listed salmon and steelhead that migrate through the system.

- Maximize spillway survival by selecting the most biologically effective level of spillway discharge at each project while not exceeding interim gas supersaturation standards.[10] Balance spillway

[10] Under current system operations for migrating anadromous fish, including under biological opinion operations, the federal operating agencies must secure a waiver from Oregon to the existing water quality standards to allow for spill operations that will result in total dissolved gas supersaturation levels of up to 120 percent in tailraces and 115 percent in forebays. These standards are incorporated into Washington's water quality standards. The Council continues to consider current operations as well as any other specific spill operations included in these amendments to be "interim" while the Council works with the region to

survival probabilities against spillway passage efficiency and the efficiency and probabilities of other passage routes in order to determine the passage methods, including spill volumes that maximize survival of fish passing the dam and minimize fall-back and other effects on adult salmon.

- Improve adult fish migration survival through the system.

- Contribute to achieving desired smolt-to-adult survival rates (SARs) described in the basinwide biological objectives.

c. Resident Fish and Wildlife

- Improve the survival and production of resident fish in the mainstem by enhancing the inriver migration, habitat, and water-quality conditions consistent with the biological objectives of this program, ESA requirements and state and federal water-quality standards under the Clean Water Act.

- Provide conditions that support the needs of resident fish species in upstream reservoirs and river reaches, as well as the needs of anadromous and resident species in the lower parts of the mainstem.

- In accordance with Section 4(h)(11)(A) of the 1980 Power Act, and the Council's primary strategy for hydrosystem fish passage and operations, Bonneville and the other federal agencies responsible for managing, operating or regulating any federal or non-federal hydroelectric facility for purpose of flow or spill advantages to ESA-listed species shall assure, in consultation with the Secretary of the Interior and the Administrator of NOAA Fisheries, together with state fish and wildlife agencies and appropriate Indian tribes, that flow and spill operations are optimized to produce the greatest biological benefits with the least adverse effects on resident fish.

- Enhance the abundance and productivity of white sturgeon in the mainstem in order to rebuild and sustain naturally produced populations of sturgeon and sustain an annual harvest of sturgeon. Operate the hydropower system to maximize spawning and rearing success of white sturgeon in reservoirs, while operating in concert with the needs of salmonids. The U.S. Fish and Wildlife Service's 2000 and 2006 biological opinions concerning hydrosystem operations that affect listed Kootenai River white sturgeon includes specific objectives for that species, incorporated here.

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determine the most biologically effective level of spillway discharge at each project and for the system as a whole.

- Provide mainstem conditions that help to protect and enhance bull trout habitat and thus help to restore the abundance and productivity of bull trout populations that use the mainstem as they migrate into and out of tributary streams. The U.S. Fish and Wildlife Service's 2000 and 2006 biological opinions concerning hydrosystem operations that affect listed bull trout populations include objectives for that species, which are adopted here.

- Contribute to providing the conditions necessary to restore populations of native fish and wildlife in the areas above and below Hungry Horse and Libby dams to self-sustaining levels capable of supporting harvest. This includes protecting, restoring, and enhancing reservoir, riparian, and wetland habitats above and below Hungry Horse and Libby dams to meet the goals set forth in the management and mitigation plans and the recommendations of the Montana Department of Fish, Wildlife and Parks and the Confederated Salish and Kootenai Tribes. As part of this objective, 1) improve the seasonal pattern and stability of river discharges and reservoir conditions; 2) restore in-channel habitat structure, function and complexity; 3) restore riparian and wetland habitats and floodplain function; and 4) maintain water temperatures within the tolerance range of native fish species.

- Contribute to providing the conditions necessary to protect spawning and rearing habitat for fish in, and adjacent to, Lake Roosevelt to build fish populations to levels capable of supporting harvest consistent with the goals set forth in the management and mitigation plans and the recommendations of the Spokane and Colville Tribes.

- As part of implementing the wildlife strategies and achieving the wildlife objectives in the basinwide provisions above, improve survival and production of wildlife species in the mainstem affected by the development, operation, and management of the hydrosystem by reducing limiting factors to wildlife in the mainstem and improving riverine and riparian mainstem habitat conditions for these species.

D. Mainstem Strategies

1. Overarching Strategies

- The strategies stated here for the mainstem plan are based on, and consistent with, the basinwide objectives and habitat and hydrosystem strategies stated above.

- All decisions on actions that affect, or are intended to benefit, fish and wildlife in the mainstem Columbia and Snake Rivers — whether embedded in long-range plans, annual plans, or in-season management, and whether concerning water management or passage or reservoir operations — should reflect, or be based on, the following general strategies:
  - Protect wild fish, ensuring adequate survival, escapement and habitat conditions.
  - Protect the habitat areas and ecological functions that are at present relatively productive for the life stages of the species important to the biological objectives of this program, including for spawning, resting, rearing, and migration of salmon and steelhead and resident fish. Enhance and restore habitats and ecological functions that connect to protected areas.
  - Restore habitat needed by populations at risk of extinction. In particular, protect and improve habitat conditions in areas that are relatively productive for these populations, and then expand adjacent habitats that improve production.
  - Protect biological diversity by benefiting the range of species, stocks, and life-history types in the river.
  - Provide conditions that best fit those natural behavior patterns and river processes that most closely approximate the physical and biological conditions needed by the relevant species.
  - With regard to hatchery populations of salmon and steelhead, prioritize mainstem protection and support to those hatchery populations that provide the most significant contribution to the rebuilding of naturally spawning populations in areas of program habitat investments, or that provide the most significant contributions to harvest while ensuring the least detrimental impacts on the survival of native fish species.
  - Optimize actions to produce the greatest biological benefits for targeted species with the least cost, and the least adverse effects on other species, while ensuring an adequate, efficient, economical and reliable power supply.

- NOAA Fisheries and the U.S. Fish and Wildlife Service have adopted biological opinions for the operation of the Federal Columbia River Power System for the benefit of populations of salmon, steelhead, bull trout and Kootenai white sturgeon listed as threatened or endangered under the Endangered Species Act. The measures in these opinions represent the

recommendations of the federal fish and wildlife agencies with jurisdiction over the operational needs of these listed species. The Council accepts these measures as part of the fish and wildlife program for the near term. However, many of the biological opinions' measures must be subject to systematic and rigorous monitoring and evaluation, as described below and in the more specific strategies, to determine if the measures have the biological benefits expected and represent the most cost-effective actions to achieve these benefits. Based on these evaluations, the Council may recommend to the federal operating and fish and wildlife agencies operations that differ from those in the biological opinions if the Council concludes the different operations provide the same or greater benefits to listed fish and wildlife than current operations at a lower cost. The Council is confident that changes in operations of this nature can be made consistent with the flexibility built into the biological opinions.

- The biological opinions' operations may not be optimal when the needs of fish and wildlife other than listed species are taken into account. Based on the vision, the biological objectives, and the overarching strategies stated earlier, the Council is adopting water management and other specific strategies to benefit all fish and wildlife affected by the hydrosystem, not just listed species. Where the strategies intended to benefit non-listed species appear to conflict with the biological opinions, the Council does not mean that the federal operating agencies should act contrary to the biological opinions in order to implement strategies in this program. The Council intends instead that the federal operating agencies make every effort practicable to use the operational flexibility in the biological opinions to meet the biological opinion requirements and implement the other strategies in the Council's program. The exception is where the Council calls for explicit scientific testing of a particular operation in the biological opinions. The Council is confident these changes also can be made consistent with the flexibility built into the biological opinions without adverse effects on listed species and will lead to a more broad-based, sustainable, and cost-effective protection and recovery of fish and wildlife in the Columbia Basin. The Council expects the federal operating agencies and fish and wildlife agencies to consult with the Council, states, and tribes on the implementation of these strategies.

- The Council recognizes the continuing need to test certain assumptions and uncertainties in the biological opinions as they relate to spill, flow augmentation, reservoir drafting, predator control, and harvest. The Council supports the development of tests and experiments for the hydrosystem even where some may require temporary departures from operations set forth in current biological opinions. These experiments will focus on areas where the quantitative benefits from the biological opinions' operations require additional understanding or verification, or where benefits to non-listed species from varied operations may be significant without adverse impacts

on listed species, or both. This approach is consistent with the biological opinions, which allow considerable flexibility to conduct necessary tests. In the strategies, the Council specifies what tests need to occur and why. In particular, the Council emphasizes the need for the following types of testing:

- Determine more precisely the relationship between fish survival and various levels of spill at the individual dams and for the system.
- Implement and test new spill technologies such as removable spillway weirs.
- Evaluate turbine operations at the different dams to determine optimum fish survival through the turbines.
- Evaluate the benefits of incremental flow augmentation and determine the mechanisms for flow/survival relationships on the Columbia and Snake rivers.
- Measure the effects of steady June through September outflows from Libby and Hungry Horse dams in Montana.
- Evaluate and document the impact of predation in the mainstem in terms of numbers of listed fish taken, and estimated impact on smolt-to-adult return ratios.
- Evaluate and document the impact of harvest operations in terms of numbers of ESA-listed fish taken and estimated impact on smolt-to-adult return ratios.
- Test other uncertainties proposed by independent science panels and fish and wildlife managers summarized in this program and in the basinwide research plan.

There are several purposes for these tests. First and foremost is to determine the type of operation that provides the best benefits for enhancing listed and non-listed fish populations over the long term. In many cases, if it were better understood why certain operations were beneficial to fish it would be possible to adjust the operations to provide better survival. For example, the benefits of flow augmentation in the Snake River may be related to travel time, turbidity, temperature or reservoir fluctuations. Whatever the reason, operations could be made more effective if these mechanisms were better understood.

Another purpose of these tests is to better quantify the benefits of the operations so that choices can be made to assure that the same survival benefits are achieved through the lowest-cost operation. This is largely the purpose behind many of the spill tests and tests involving removable spillway weirs. Early results appear to show that removable spillway weirs can provide the same benefits as baseline spill but use one-tenth of the water. This constitutes a considerable savings in terms of hydropower generation.

Finally, there are some operations where the benefits need to be more clearly demonstrated. Only through controlled experiments can we reach a conclusion as to the merits of continuing these operations. Recent scientific reports call into question several of these operations, especially active management of the storage projects to provide flow augmentation.

It should be emphasized that this approach represents more than passive observation. It includes the option of implementing large-scale field tests of hypotheses that will sometimes require changes in hydrosystem operations. In some cases, there may be risks associated with conducting the experiment, but these risks must be weighed against the risks of continuing operations without accurate information and against the potential risks to other fish species. In implementing large-scale field tests, or any other hydrosystem tests, the Council recognizes that water used from Columbia River and Snake River storage reservoirs, or from tributary streams within the Columbia River Basin, will be obtained through federal water rights where they exist, or through the individual states where such water may be made available in accordance with state water law.

The Council is prepared to take steps necessary to properly design experiments and ensure that they are implemented. In some cases this may require the Council to work with fish and wildlife agencies and tribes to establish project teams that can develop and oversee appropriate tests while assuring opportunities for public input.

These and other monitoring and evaluation strategies are described in the mainstem strategies below and in the basinwide monitoring and evaluation strategies above. The Council expects NOAA Fisheries and the U.S. Fish and Wildlife Service to exercise the flexibility within the biological opinions to implement these tests. We also encourage NOAA Fisheries and U.S. Fish and Wildlife Service to make changes in the biological opinions when these scientific reviews and tests are completed and the results provide compelling reasons for change.

2. Strategies in Specific Areas

a. Mainstem habitat

Through system operations and continued investments in mainstem habitat improvements, increase the extent, diversity, complexity, and productivity of mainstem habitat by protecting, enhancing, and connecting mainstem spawning, rearing, and resting areas. Actions to consider include, but are not limited to:

- providing appropriate spawning, rearing, and resting flows in the mainstem;
- excavating backwater sloughs, alcoves, and side channels;
- reconnecting alcoves, sloughs and side channels to the main channel;
- dredging/excavation of lateral channels that have silted in;
- enhancement of wetlands;
- creating islands and shallow-water areas;
- stabilizing the water levels of the rivers and reservoirs to the extent practicable;
- planting riparian and aquatic plants at appropriate locations; and
- acquiring and protecting lands adjacent to the mainstem.

Federal and state fish and wildlife agencies should analyze each proposed action to increase mainstem spawning and rearing habitat to ensure that the proposal may be implemented without adversely affecting the migration of listed populations through the mainstem.

In instances where proposed operations to protect or enhance mainstem spawning and rearing habitat may conflict with operations intended to benefit juvenile or adult salmon migration, the system operators and the fish and wildlife agencies and tribes should identify potential conflicts, priorities, trade-offs, and opportunities and consult with the Council, affected entities, and the public on how best to resolve conflicting needs.

The Council expects the federal operating agencies, in conjunction with the Environmental Protection Agency and the U.S. Geological Survey, to develop a program to 1) identify mainstem habitat sampling reaches, survey conditions, describe cause-and-effect relationships and identify

research needs; 2) develop improvement plans for all mainstem reaches; and 3) initiate improvements in three mainstem reaches. This mainstem habitat initiative should not focus wholly, or even predominantly, on the mainstem habitat needs of the populations currently listed. Salmon mitigation, enhancement, and restoration opportunities in the mainstem may have greater relation to non-listed populations than to listed populations.

In addition, the Council expects the federal operating agencies, in conjunction with the relevant state and federal fish and wildlife agencies and tribes to:

- Identify the importance of protecting or improving mainstem habitat for recovering bull trout populations. The Council expects the relevant state and federal fish and wildlife agencies to conduct the necessary research and report the analysis to the Council at the earliest possible date.

- Develop and implement actions that create littoral habitat and fish structures along the shores of Lake Roosevelt to diversify food available to fish and provide additional rearing habitat.

- Implement actions to stabilize and improve Columbia River white sturgeon and to recover listed Kootenai River white sturgeon.

- Implement actions to stabilize and improve burbot populations in the upper Columbia.

- Improve juvenile and adult Pacific lamprey passage survival and reduce delays in migration through mainstem hydroelectric projects.

b. Water quality

The federal action agencies should continue to update the *Water Quality Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers* (WQP) and implement water quality measures to enhance both ESA-listed and unlisted juvenile and adult fish survival and mainstem spawning and rearing habitat. The WQP is a comprehensive document containing water quality improvement measures needed to meet Northwest Power Act, ESA and Clean Water Act responsibilities. The WQP should include:

- Real-time monitoring and reporting of total dissolved gas (TDG) and temperatures measured at fixed monitoring sites;

- Continued development of fish passage strategies that produce less TDG, e.g., spillway weirs and surface passage outlets, including updates to the System Total Dissolved Gas (SYSTDG) model to reflect ongoing modifications to spillways or spill operations;

- Continued development and use of the SYSTDG model for estimating TDG production to assist in real-time decision-making for spill operations, including improved wind forecasting capabilities as appropriate;

- Continued development of the Corps' CE-QUAL-W2 model for estimating mainstem Snake River temperatures and cold water releases from Dworshak Dam on the Clearwater River to assist in real-time decision-making for Dworshak summer operations;

- Expanding the water temperature modeling capabilities to include the Columbia River from Grand Coulee to Bonneville dams to better assess the effect of operations or flow depletions on summer water temperatures; and

- Implement actions to reduce toxic contaminants in the water to meet state and federal water quality standards. The federal action agencies should partner with and support federal, state, and regional agencies' efforts to monitor toxic contaminants in the mainstem Columbia and Snake rivers and evaluate whether these toxic contaminants adversely affect anadromous or resident fish important to this program. If so, implement actions to reduce these toxic contaminants or their effects if doing so will provide survival benefits for fish in mitigation of adverse effects caused by the hydrosystem. In particular, investigate whether exposure to toxics in the mainstem, combined with the stress associated with dam passage, leave juvenile salmon more susceptible to disease and result in increased mortality or reduced productivity.

c. Juvenile and adult passage, in general

- Consistent with the juvenile and adult passage performance standards in the FCRPS Biological Opinion, and with the biological objectives and overarching strategies above, all actions to provide or improve juvenile and adult fish passage through mainstem dams should emphasize adult survivals as a high priority. In addition, strategies should protect biological diversity by benefiting the broad range of species, stocks, and life-history types in the river, not just listed species, and should favor solutions that best fit natural behavior patterns and river processes. To meet the diverse needs of multiple species and allow for uncertainty, multiple juvenile passage methods may be necessary at individual projects.

- The U.S. Army Corps of Engineers, working within the regional fish and wildlife project selection process, should report to the Council annually on how decisions on fish passage improvements take into account the strategies in the Council's program. In addition, the Council: 1) expects that the Independent Scientific Review Panel will apply these strategies during the panel's review of the reimbursable portion of the Bonneville fish and wildlife budget, which includes the Corps' passage program; 2) will itself apply these standards in its review of any Independent Scientific Review Panel report and resulting recommendations to Congress on these passage budget items; and 3) will recommend to Congress, in its reimbursable budget recommendations, that annual Columbia River Fish Mitigation (CRFM) Program budget requests from the Corps of Engineers be evaluated for consistency with these principles.

- The Corps of Engineers should apply cost-effective value engineering procedures to all fish passage projects that exceed $10 million, using firms independent of the Corps of Engineers. The value engineering method is an efficient and productive decision-making process which uses: a) systematic and organized procedural processes; b) creative methods to generate alternatives; c) essential functional approach; and d) comparisons of worth compared to life-cycle costs.

- For the purpose of planning for this fish and wildlife program, and particularly the hydrosystem portion of the program, the Council assumes that, in the near term, the breaching of any dams in the mainstem will not occur. The Council revises its fish and wildlife program every five years, at a minimum. If, within that five-year period, the status of the lower Snake River dams or any other major component of the Columbia River hydrosystem has changed, the Council can take that into account as part of the review process.

d. Juvenile fish transportation

- Because the existence of the dams and reservoirs creates conditions that are not natural, the Council seeks to improve inriver migration conditions. The Council recognizes that there are survival benefits from transportation of migrating juvenile salmon under certain inriver conditions. Therefore, the Council 1) continues to accept juvenile fish transportation as a transitional strategy used to help meet system survival performance metrics; 2) will give priority to the funding of research that more accurately measures the effect of improved inriver migration compared to transportation and the comparative rate of adult returns to the spawning grounds of transported and inriver migrants; 3) recommends using adaptive management to make appropriate adjustments in transport operations when research or new information demonstrates that a modified transportation protocol is warranted; and 4) endorses the strategy of "spread the risk" until it is determined whether migration inriver or transportation provides the best levels of survival.

- NOAA Fisheries' 2008 FCRPS Biological Opinion includes actions concerning the transportation of ESA-listed juvenile salmon and steelhead. These are part of the biological opinion measures that the Council incorporates into its mainstem plan.

- In analyzing in any year the potential benefits of maximizing or minimizing transportation, the federal operating agencies must recognize that significant populations of both listed and unlisted salmon and steelhead important to the biological objectives of this program enter the mainstem hydrosystem either below the transport projects altogether or above McNary Dam but are not, or not effectively, transported at McNary. Inriver passage of these fish is either the only passage alternative available or the most significant passage alternative.

- The three highest priorities for juvenile transportation studies should be to:

    - evaluate whether the survival benefits of transporting fall chinook from McNary Dam are sufficiently greater, at least under certain circumstances, than inriver passage to justify continuing (or increasing) the transport effort from that dam;
    - conduct a transportation study that targets Snake River fall chinook, including investigation and identification of key early life history characteristics for both yearling and subyearling life histories; and

- more clearly determine what delayed differential survival effects (D-value), if any, occur due to transport operations, such as adverse effects on homing behavior, and address other ISAB recommendations.[11]

- NOAA Fisheries should conduct annual evaluations of the effectiveness of, and improvements in, transportation operations and report the results to the Council and the Independent Scientific Advisory Board.

[11] For the entirety of the ISAB recommendations, see *ISAB Latent Mortality Report* (ISAB 2007-1).

3. Spill

- When making long-term, annual, and in-season decisions for when, and to what extent, to spill water for passage, the federal action agencies should give priority to 1) minimizing impacts on returning adults and 2) optimizing inriver passage survival benefits for populations that are important to the biological objectives of this program, especially those that cannot be transported or are ineffectively transported. This includes spring chinook from the John Day River; wild, naturally spawning, and key hatchery populations of spring chinook from other tributaries above Bonneville Dam but below the transport projects (or where only a small proportion are collected at McNary), such as from the Deschutes, Hood, Wind, Klickitat, Umatilla and Yakima rivers; the listed Upper and Middle Columbia steelhead; the listed Upper Columbia chinook, Hanford Reach fall chinook; and Snake River chinook, to the extent transportation should be determined to be ineffective. These spill objectives will require a better understanding of the spill levels that optimize passage survival at each dam and how these may change at various flow levels and after implementation of system configuration improvements for the range of fish populations that pass each project.

- The federal action agencies and NOAA Fisheries, in consultation with the other federal and state fish and wildlife agencies and tribes and the Council, should evaluate and determine an optimal juvenile fish passage strategy at each dam and for each passage route to meet both the hydrosystem survival performance standards and the requirements of the Clean Water Act for total dissolved gas while minimizing adult fallback problems. Thus the dates and levels for spill operations identified in the NOAA Fisheries 2008 FCRPS Biological Opinion for each project may be modified through the regional implementation planning process and adaptive management process. The Council seeks to maximize improvements in life-cycle survival. This requires determining the cumulative effects on fish survival of passing multiple dams and taking that information into account.

4. Surface Passage Systems and New Fish Passage Technologies

- To provide passage for juvenile fish that optimizes the survival of focal species by closely approximating natural physical and biological conditions, and to increase the energy produced by the hydrosystem, the U.S. Army Corps of Engineers, in consultation with other regional entities, should continue testing and developing surface bypass systems at mainstem dams, taking into account the widest range of biological diversity as described in the mainstem biological objectives and overarching strategies, utilizing an expedited approach to prototype development, and ensuring full evaluation for the developmental phase.

- The U.S. Army Corps of Engineers, in consultation with other entities, should design, test, and evaluate passage methods and technologies that could produce the same or greater benefit to fish while spilling less water, especially what are known as spillway weirs and surface flow outlets. If these methods and devices produce positive results, they should be implemented as soon as it is practical to do so.

5. Juvenile Bypass Systems

- In order to provide passage for juvenile fish that optimizes the survival of focal species, including by reestablishing natural river processes that most closely approximate natural physical and biological conditions, and to increase the energy produced by the hydrosystem, the U.S. Army Corps of Engineers and Bonneville should:

    - consider all relevant biological information and criteria in preparing configuration and operations plans for each mainstem project, taking into account the widest range of biological diversity as described in the mainstem biological objectives and overarching strategies, with the objectives of reducing passage delay and increasing fish survival through the forebay, dam and tailrace to meet the survival performance standards;
    - relocate bypass outfalls in those circumstances where there are problems with predation, tailrace egress, or other factors contributing to juvenile fish injury or mortality;
    - modify turbines or optimize turbine operations to improve juvenile survival;
    - conduct research on fish diseases at fish passage and collection facilities; and
    - modify operations or structures where spill deflectors are causing fish mortality.

6. Adult Passage

- The U.S. Army Corps of Engineers should improve the overall effectiveness of the adult fish passage program. This includes expediting schedules to design and install improvements to fish passage facilities. The ultimate survival and successful spawning of adult fish are a high Council priority because returning adults determine the size and health of future fish populations. Where it is beneficial, cool water releases from reservoirs should continue to be used to facilitate adult migration. More emphasis should be placed on research; monitoring and evaluation; increased accuracy of fish counts; expansion of fish counting to all species of interest; including lamprey, installation of PIT-tag and radio-tag detectors; evaluation of escapement numbers to spawning grounds and hatcheries; research into water temperature and spill effects on fish passage; and the connection between fish passage design and fish behavior. In particular:

    - as a priority for the Corps of Engineers' capital construction program, implement structural improvements to correct adult fish passage problems or improve reliability of adult passage facilities and report annually to the Council on progress;
    - install adult PIT-tag detectors at key projects that do not have them;
    - improve fish counting accuracy and evaluate adult survival (conversion rates); and
    - starting at The Dalles Dam, investigate the use of, or need for, surface flow outlets during the winter months to provide a safer fallback route for over-wintering steelhead and kelts.

- Bonneville and the U.S. Army Corps of Engineers, in coordination with federal, state and tribal fish managers and the Council, should prepare and implement a Snake River steelhead kelt management plan to improve the inriver survival and productivity of B-run steelhead populations.

7. Lamprey and Sturgeon Passage

a. Lamprey

In the Columbia River Basin, Pacific lampreys traditionally migrate hundreds of miles through both mainstem Columbia and Snake river habitats, encountering a variety of obstacles that could negatively affect their populations. Large mainstem hydropower dams, which are designed primarily to effectively pass salmon and steelhead, delay and obstruct adult and juvenile lamprey passage. Predation may also be a limiting factor for mainstem passage of lamprey. Juvenile lamprey have been observed in the stomach contents of smallmouth bass and Northern pikeminnow in the tailraces of lower Columbia River federal dams, and adult lamprey have been observed being taken by California sea lions downstream of Bonneville Dam.

- Bonneville and the U.S. Army Corps of Engineers, in coordination with federal, state and tribal fish managers and the Council, should implement the following measures to improve adult and juvenile Pacific lamprey passage survival and reduce delays in migration:
  - Identify specific fish passage structures;
  - Identify operations at mainstem hydropower dams that delay, obstruct or kill migrating lamprey;
  - Develop and implement lamprey passage aids at known passage obstacles;
  - Monitor lamprey passage at mainstem hydropower dams to evaluate passage improvement actions and to identify additional passage problem areas;
  - Assess lamprey passage efficiency, direct mortality and/or other metrics relating to migratory success of lamprey; and
  - Determine predation on lamprey during mainstem passage.

b. Sturgeon

Ongoing changes in system operations and dam configuration affect the movement of white sturgeon in the lower Columbia. Studies indicate that white sturgeon move downstream through the reservoirs and pass downstream through spillways. The installation of removable spillway weirs at dams may affect downstream passage by white sturgeon via spillways. Bonneville and the Corps of Engineers should:

- Study the effects on downstream passage of white sturgeon with and without removable spillway weirs;

- Estimate mortality by size for fish that pass over spillways and removable spillway weirs and those that pass downstream through turbines;

- If significant mortality is occurring, identify and evaluate the feasibility of mitigation measures; and

- In general, evaluate the importance of connectivity among sturgeon populations; assess whether the mainstem dams isolate sturgeon populations; and if so, evaluate the feasibility of mitigation.

8. Water Management

- Manage water through the hydrosystem to optimize survival of focal species, including by reestablishing patterns of flow that more closely approximate the natural hydrographic patterns and are directed at re-establishing natural river processes where feasible, and produce the highest possible survival rates for a broad range of affected fish within the physical limitations of the multiple purposes of the region's storage reservoirs and hydrosystem. Assure that any changes in water management are premised upon, and proportionate to, fish and wildlife benefits, while assuring the region an adequate, efficient, economical, and reliable power supply. Elements of this general strategy for water management include:

    - Frame habitat restoration in the context of measured trends in water quantity and quality.
    - Allow for seasonal fluctuations in flow, including floods. Reduce large and rapid short-term fluctuations. Reduce or eliminate stranding and other problems associated with fluctuation of the hydroelectric system.
    - Increase the correspondence between water temperatures and the naturally occurring regimes of temperatures throughout the basin. To the extent possible, use stored water to manage water temperatures below the storage reservoirs where temperature benefits from releases can be shown to provide improved fish survival.

- Systemwide water management, including flow augmentation from storage reservoirs, should attempt to meet the needs of both anadromous and resident fish species in the river and upstream storage reservoirs, so that actions taken to benefit one species do not unnecessarily come at the expense of other species. Flow augmentation is defined as the intentional release or drafting of water from storage reservoirs for the purpose of increasing flows to enhance migratory conditions for juvenile and adult life-stages of salmon and steelhead through the reach of the lower river hydroelectric dams. The federal system operators, NOAA Fisheries and the U.S. Fish and Wildlife Service should identify potential conflicts and seek recommendations from the Council, fish and wildlife agencies, tribes, and other affected entities on how best to balance the different needs prior to the implementation of flow actions.

Baseline operations of the Federal Columbia River Power System established in the 2008 Biological Opinions

- NOAA Fisheries' 2008 Biological Opinions for the FCRPS and the Upper Snake federal projects include a series of measures concerning water management for the benefit of listed juvenile salmon and steelhead, while the U.S. Fish and Wildlife Service's 2000 and 2006 Biological Opinions include a

set of measures concerning water management for the benefit of listed bull trout and Kootenai River white sturgeon. The water management measures in these biological opinions are incorporated as part of this program, and the Council concurs that these are appropriate operations to protect, mitigate, and enhance those anadromous and resident fish listed under the Endangered Species Act and affected by the Columbia hydrosystem.

- The Council may adopt additional water management strategies to protect, mitigate, and enhance all fish and wildlife affected by the hydrosystem and meet the biological objectives and vision of its program. To the extent these water management strategies appear to conflict with the biological opinions, the Council does not mean that the federal operating agencies should act contrary to the biological opinions in order to implement the strategies in this program. The Council intends instead that the federal operating agencies make every effort practicable to use the operational flexibility in the biological opinions to meet the biological opinion requirements and implement the water management strategies in this program.

Hanford Reach/mainstem and estuary spawning, rearing, and resting habitat

- Manage flows, while maintaining consistency with this mainstem plan's flow and reservoir operations, to protect, improve, and expand spawning, rearing, and resting habitat in the mainstem and estuary. In particular, the federal and non-federal project operators should provide suitable and stable flows to establish and protect the habitat conditions necessary for spawning and rearing in the Hanford Reach on an equal basis as managing water to support the migration of listed species. This includes providing the flows required by the Vernita Bar agreement and by subsequent agreements to extend stable flows to reduce or prevent stranding problems in the Reach. It also includes the need for the Bureau of Reclamation, as the operator of Grand Coulee Dam, and the operators of the mid-Columbia projects to take the steps necessary, separately and together, to further reduce flow fluctuations through the Reach that affect spawning and rearing.

Spring reservoir/flow operations in general

- Refill should be a high priority for spring operations at Hungry Horse, Libby, Grand Coulee, and Dworshak dams so that the reservoirs have the maximum amount of water available during the summer. While on average the target date for refill should be early July for Libby and the end of June for the other projects, the system operators should work to adjust the actual refill date based on reservoir conditions and inflow forecasts.

- Incorporating the biological opinions of NOAA Fisheries and the U.S. Fish and Wildlife Service into this program includes the opinions' approach to spring water management in general, which the Council understands as

operating the storage reservoirs to ensure a high probability of water surface elevations within one-half foot of the upper flood control rule curve by April 10 and a high probability of refill, otherwise passing the spring runoff through the storage reservoirs.

Spring operations at Hungry Horse and Libby dams

- **VARQ flood control operations and Integrated Rule Curve operations.** At Hungry Horse and Libby dams, continue to implement the VARQ flood control operation called for in the biological opinions and implement the Integrated Rule Curve operations as recommended by the Montana Department of Fish, Wildlife and Parks for the benefit of native resident fish in those reservoirs. Operations should reduce the frequency of refill failure (to within five feet of full pool) at Hungry Horse and Libby reservoirs as compared to historic operation. Implement seasonal flow windows and flow ramping rates in the Flathead and Kootenai rivers downstream of the storage reservoirs, and maintain minimum flows in the Flathead and Kootenai rivers as described by the U.S. Fish and Wildlife Service's 2000 and 2006 Biological Opinions and the Montana Department of Fish, Wildlife and Parks, including the sliding-scale flow strategy for bull trout specified by the biological opinions. Implement VARQ operations in an attempt to avoid the more extreme adverse effects at Grand Coulee that occur in a small percentage of years. The Corps of Engineers should consult with the Council to identify those occurrences and effects and to determine what might be done to minimize or avoid them, and report annually to the Council on VARQ implementation to show that these extreme adverse effects are not occurring.

- **Operations at Libby Dam to benefit Kootenai River white sturgeon.** The U.S. Fish and Wildlife Service's 2006 Biological Opinion concerning hydrosystem operations that affect ESA-listed Kootenai River white sturgeon specifies a "tiered" strategy for flow augmentation from Libby Dam to simulate a natural spring freshet, controlled within flood constraints, to improve the habitat attributes for white sturgeon spawning/recruitment. Volumes dedicated to spring sturgeon flows are determined by forecasted water availability so that higher flows are released when ample water is available and minimal flow augmentation occurs during drought. Augmentation volumes in any given year will depend on flood control constraints, reservoir refill targets, water availability, and benefits to the Kootenai white sturgeon population

  The Council recognizes that additional work may be required to further refine appropriate sturgeon operations at Libby Dam, and recommends that regional entities continue to work to increase the biological benefits provided by the tiered flow augmentation volumes.

Spring operations at Grand Coulee Dam

- Operate Grand Coulee Dam in the winter and spring (from January through June) consistent with the 2008 FCRPS Biological Opinion operations and ordinary hydrosystem operations, with the following considerations:

    - Two high priorities for Grand Coulee through the year should be to contribute to the establishment and protection of the necessary conditions in the Hanford Reach described earlier and to refill by the end of June.
    - As much as possible, manage the reservoir and dam discharges to produce steady flows across each season and each day to minimize reservoir fluctuations and ramping rates.

Spring and summer water management in the Snake River

- Spring and summer water management in the Snake River should be consistent with NOAA Fisheries' 2008 Biological Opinion, with the following additional observations:

    - Provide up to 487 Kaf of water from the Bureau of Reclamation's Upper Snake River Basin projects consistent with the NOAA Fisheries' 2008 Upper Snake Basin Biological Opinion. Providing water from Idaho Power Company's Hells Canyon projects to assist in achieving Snake River flow objectives at Lower Granite Dam and/or fall chinook spawning and incubation flows in the Hells Canyon reach will be addressed in a separate, ongoing ESA Section 7 consultation. Flows or volumes of water will be made available from upper Snake River storage by the Bureau of Reclamation or any other entity only if consistent with applicable state and federal law, including but not limited to, Idaho Code §42-1763B.[12]

Summer reservoir operations at Hungry Horse and Libby, Grand Coulee and Dworshak Dams

- **Hungry Horse and Libby Dams:**

    - Reduce the frequency of refill failure (to within five feet of full pool) as compared to historic operations; implement seasonal flow windows and flow ramping rates in the Flathead and Kootenai rivers downstream of the storage reservoirs and maintain minimum flows in the Flathead and

[12] No provision of this amendment may, by recommendation of the Council, propose to "(1) affect the rights or jurisdictions of the United States, the States, Indian tribes, or other entities over waters of any river or stream or over any groundwater resource, (2) alter, amend, repeal, interpret, modify or be in conflict with any interstate compact made by the States, or (3) otherwise be construed to alter, or establish the respective rights of States, the United States, Indian tribes, or any person with respect to any water or water related right." Northwest Power Act, Section 10(h).

Kootenai rivers as described by the U.S. Fish and Wildlife Service's 2000 Biological Opinions and the Montana Department of Fish, Wildlife and Parks.

- Implement and evaluate a summer operation at both projects as follows:
  - Summer reservoir drafting limits at Hungry Horse and Libby should be 10 feet from full pool by the end of September (elevations 3550 and 2449, respectively) in all years except the lowest 20th percentile water supply (drought years) as measured at The Dalles Dam, when the drafts may be increased to 20 feet from full pool by the end of September. This would protect fisheries resources in the reservoirs and rivers downstream, while providing additional flow augmentation for fish immediately below the project(s) and in the lower Columbia River.

  - Draft each storage reservoir according to elevation limitations that, when combined with projected inflows, result in stable and "flat" or very gradually declining weekly average outflows from July through September. The agencies should also continue to investigate creative water management actions for summer flows, including what are known as the "Libby-Arrow" and "Libby-Duncan" swaps, although implementation of the summer operations experiment at Hungry Horse and Libby is not to be dependent on these actions.

- **Operate Grand Coulee Dam** from July through December consistent with the 2008 FCRPS Biological Opinion operations and with ordinary hydrosystem operations, with the following considerations:

  - Draft evenly from Lake Roosevelt to the target elevations of 1278 or 1280 feet by the end of August. As specified in Washington's *Columbia River Basin Water Management Program*, by the end of August Lake Roosevelt will be drafted by an additional 1.0 foot in non-drought years and by about 1.8 feet in drought years.[13] As much as possible, manage the reservoir and dam discharges to minimize fluctuations and ramping rates and produce steady flows across each season and each day to minimize reservoir fluctuations and ramping rates.
  - From September through December, attempt to maximize water retention times and protect kokanee access and spawning. Federal operators, fish and wildlife managers, and others should consult with the Council to determine how to provide the biological benefits above while meeting biological opinion requirements, including chum flows, and operating to protect flows for the Hanford Reach.
  - Attempt to maximize water retention times from June to December of 40 to 60 days, or the maximum historically achievable for each month.

[13] The definition of a drought year in this case is when the March water supply forecast for the April through September period at The Dalles is less than 60 million acre-feet (MAF).

- Two high priorities for Grand Coulee through the year should be to contribute to the establishment and protection of the necessary conditions in the Hanford Reach described above and to refill by the end of June. Summer and fall operations should be consistent with these priorities.

- **Dworshak Dam**

  - Operate Dworshak Dam consistent with the provisions of the 2008 FCRPS Biological Opinion, as implemented through the Corps of Engineers with input from the Regional Forum Technical Management Team, as follows:
    - Priority should be to refill the project by June 30.
    - For flow augmentation purposes, Dworshak should be drafted to elevation 1535 feet by the end of August and to elevation 1520 feet by the end of September, unless modified per the agreement between the United States and the Nez Perce Tribe for water use in Dworshak Reservoir.
    - During the summer flow augmentation operation, regulate Dworshak discharges and outflow temperatures with the goals of: a) attempting to maintain water temperatures in the Lower Granite Dam tailwater at or below the State of Washington's water quality standard of 20 degrees Celsius (68 degrees Fahrenheit), and b) remaining within the State of Idaho's TDG water quality standard of 110 percent saturation.

9. Climate Change Planning Considerations

Climate change could have significant effects on mainstem Columbia and Snake river flows in terms of runoff timing, water quantity and temperature. Possible changes in regional snowpack, river flows and reservoir elevations due to climate change could have a profound impact on the success of restoration efforts and the status of Columbia Basin fish and wildlife populations. The Council acknowledges that global climate change is not directly caused by the hydrosystem. However, to the extent climate change may further adversely affect fish and wildlife affected by the hydrosystem, it is appropriate for the Council to seek the best available scientific knowledge regarding the effects of climate change and to consider that scientific data when recommending program strategies and implementation measures.

The Federal action agencies, in coordination and collaboration with others, should:

- Support the advancement of runoff forecasting techniques. Continue to encourage, monitor, and promote public awareness of pertinent climate change research and information and assess how it should influence program mitigation efforts.

- Assess whether climate change effects are altering or likely to alter critical river flows or other habitat attributes in a way that could significantly affect fish or wildlife important to this program,[14] either directly or by affecting the success of current mitigation efforts.

- If so, evaluate whether alternative water management scenarios, including changes in flood control operations, could minimize the potential effects of climate change on mainstem hydrology. Evaluate the effectiveness and feasibility of possible actions to mitigate effects of climate change, including selective withdrawal from cool/cold storage reservoirs to reduce water temperatures or other actions to create or protect cool water refugia in mainstem reaches or reservoirs.

- Under similar conditions, investigate the feasibility of mitigating climate change impacts in the estuary and plume through changes in hydrosystem operations, including changes in flood control operations.

[14] "Fish or wildlife important to this program" means fish or wildlife already adversely affected by the hydrosystem and thus the subject of program mitigation efforts.

10. Control of Predators

a. Piscivorous predator control

- Bonneville should continue to implement annually the base program and continue the general increase in reward structure in the northern pikeminnow sport-reward fishery consistent with the increase starting in 2004. The action agencies should evaluate the effectiveness of focused pikeminnow removals at The Dalles and John Day dams and implement as warranted. Scoping of focused pikeminnow removals at other mainstem dams or in the lower Columbia River will be based on evaluations and adaptive management principles with input from NOAA Fisheries, other regional fisheries managers, and the Council.

- The federal action agencies will work cooperatively with NOAA Fisheries, states, tribes and the Council to review, evaluate, develop and implement strategies to reduce non-native piscivorous predation on salmon and steelhead, especially by smallmouth bass, channel catfish and walleye.

b. Avian predator control

- The federal action agencies should continue efforts to reduce the number of Caspian terns on East Sand Island in the lower Columbia River and estuary by implementing the U.S. Fish and Wildlife Service Caspian Tern Management Plan.

- The federal action agencies should develop a double-breasted cormorant management plan encompassing additional research, development of a conceptual management plan, and implementation of warranted actions in the lower Columbia River and estuary.

- The federal action agencies should develop an avian management plan (for double-breasted cormorants, Caspian terns, and other avian species) for Corps-owned lands and associated shallow-water habitat areas in the mid-Columbia area.

- The U.S. Army Corps of Engineers should continue to implement and improve avian deterrent programs at all lower Snake and Columbia River dams.

c. Marine mammal predator control

- The U.S. Army Corps of Engineers should take action to improve the exclusion of sea lions at all main adult fish ladder entrances at Bonneville Dam.

- The Corps should continue to support land and water-based harassment efforts by NOAA Fisheries, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, and tribes to keep sea lions away from the area immediately downstream of Bonneville Dam.

- The federal action agencies should also evaluate the extent of marine mammal predation on salmonids, sturgeon and Pacific lamprey in the lower Columbia River from below Bonneville Dam to the mouth of the river.

- Lethal take to control marine mammal predators consistent with state and federal law is appropriate when non-lethal methods of control are not successful and the adverse impacts are significant.

11. Non-Native Species Evaluation and Control

The Council acknowledges invasive non-native species pose direct threats to the program's fish and wildlife restoration efforts through competition, predation and habitat modification. In addition to threatening native fish and wildlife habitat, aquatic non-native species can invade and significantly threaten infrastructure at hydroelectric dams and fish passage facilities in the Columbia River Basin. Currently, the greatest known threat to the FCRPS from aquatic nuisance species is introduction into the basin of the zebra or quagga mussel, followed by Eurasian milfoil. Once established, management actions taken in other locales have shown little success in removing or controlling these invasive non-native species. Accordingly, the Council expects:

- Where aquatic non-native species pose both a direct threat to the hydropower system or to native fish species, federal action agencies should support ongoing federal, state, and tribal efforts to prevent, monitor, control and minimize the spread of non-native species, including zebra or quagga mussels and Eurasian milfoil, that threaten the success of fish and wildlife program measures.

- The federal action agencies, states, tribes and the Council will review, evaluate and develop strategies to reduce competition from non-native species, such as shad, with juvenile and adult salmonids.

- Lethal take to control non-native predators or competitors consistent with state and federal law is appropriate when non-lethal methods of control are not successful and the adverse impacts are significant.

12. Mainstem Monitoring and Evaluation

- The Monitoring, Evaluation, Research and Reporting strategies in the basinwide provisions describe a general strategy for monitoring and evaluation across the program, including guidelines for collecting data. The emphasis is on developing and implementing criteria for monitoring and evaluating management activities and reporting results relevant to the program framework and biological objectives. The monitoring and evaluation elements stated earlier in the various mainstem strategies, and the general provisions in this section, are intended to be consistent with this general monitoring and evaluation strategy.

- The Council may assist the federal agencies in reviewing the results of research, monitoring and evaluation efforts to identify whether actions taken are achieving the hydrosystem performance standards and objectives in the 2008 FCRPS Biological Opinions, and also whether the research and evaluation results confirm or call into question the soundness of the standards themselves. The Council incorporates the NOAA Fisheries 2008 Biological Opinion juvenile and adult passage performance standards for federal mainstem dams into the program.[15] These survival standards should also apply to unlisted salmonids passing federal dams.

[15] The juvenile fish performance standards are an average across Snake River and lower Columbia River dams of 96 percent average dam passage survival for spring Chinook and steelhead (spring migrants) and 93 percent average dam passage survival for Snake River fall Chinook subyearlings (summer migrants). The adult fish passage performance standards can be found in Table 7 of RPA No. 51 - Hydrosystem Research, Monitoring and Evaluation of the NOAA Fisheries 2008 FCRPS Biological Opinion.

13. Research

- **Fish and Wildlife Program**. The Monitoring, Evaluation, Research and Reporting strategies in the basinwide provisions above describe a strategic approach regarding research related to the program, including identification of key uncertainties for the program and its biological objectives. The research elements stated earlier in the various mainstem strategies, and the general provisions in this section, are intended to be based on, and consistent with, this general research strategy.

- **Research aimed at optimizing fish and wildlife benefits and energy production.** Actions taken to benefit fish and wildlife should also consider and minimize impacts to the Columbia basin hydropower system if at all possible. The goal should be to try to optimize both values to the greatest degree possible. Thus, a high priority for mainstem passage research in general should be to try to determine what actions can be taken to provide both high fish and wildlife and energy benefits, or at least to increase one set of benefits without degrading the other. As an example, spill is an operation for fish with a significant energy impact for the power system. As described above in the strategy on spill, an optimal juvenile fish passage operation should be developed at each project and examined, in conjunction with surface passage and other passage improvements, to determine whether spill can be more effectively utilized to improve fish survival and lessen its impacts to energy production.

- **Approach to prioritizing research ideas and proposals**. In deciding what mainstem research to fund or implement, the assigning of priorities should take into account a wide array of factors, such as:

    - potential biological benefits to fish and wildlife, especially whether a fish passage project will help meet the juvenile or adult dam passage survival performance standards;
    - widespread scientific value — can what is learned be applied to other situations?
    - management application;
    - degree of uncertainty of the question asked;
    - cost of the research;
    - cost of the proposal on power system;
    - potential cost to implement the results of research;
    - level of completion/duplication;
    - legal relevance — does the research activity respond to the biological opinion and/or to the fish and wildlife program, or to other legal requirements?
    - feasibility in the technical sense — is the proposal a reasonable way to complete this activity?

- “feasibility ” in the legal/institutional sense.

Research proposals should be evaluated against each of these important elements, with the results combined in a variety of ways to expose the weight of different variables. A broad representation of regional entities should be involved in prioritizing proposals, including review by the independent scientific review panels. Policy-makers should be more involved in the final decisions on long-term and annual research plans.

14. Fish Passage Center

The program calls for the continued operation of the Fish Passage Center (Center). The primary purpose of the Center is to provide technical assistance and information to fish and wildlife agencies and tribes in particular, and the public in general, on matters related to the implementation of water management, spill, and passage measures in the program's Mainstem Plan.

In performing this function, the Center shall:

- Assemble, organize, make publicly available, and maintain the primary archive of the smolt monitoring program data;

- Participate in the development of the annual smolt monitoring program implementation plan, and assist in the implementation of the program;

- Assemble, organize and make publicly accessible, data from other primary sources, and conduct analyses as requested, to meet the information needs of the fish and wildlife agencies, tribes and public with respect to water management, spill, and passage;

- Provide technical information necessary to assist the agencies and tribes in formulating in-season flow and spill requests that implement the measures in the Council's program, while also assisting the agencies and tribes in making sure that operating criteria for storage reservoirs are satisfied;

- In general, provide the technical assistance necessary to coordinate recommendations for storage reservoir and river operations that, to the extent possible, avoid potential conflicts between anadromous and resident fish; and

- Archive and make publicly accessible the data used in developing all analytical results produced by the Center, associating the specific data with the respective analyses.

Many questions pertaining to water management and fish passage in the mainstem Columbia and Snake rivers contain both scientific and policy aspects. The Center should confine itself to dealing only with the scientific aspects of issues.

The Council has established an oversight board for the Center, with representation from NOAA Fisheries, state fish and wildlife agencies, tribes, the Council, and others to ensure that the Center carries out its functions consistent with the Council's program. The oversight board will conduct an annual review of the performance of the Center and develop a goal-oriented plan for the Center's operation to assure regional accountability and compatibility with the regional data management system, as well as program consistency. The oversight board

will also work with the Center and the ISAB to organize a regular system of independent science review of appropriate Center products. The Center shall prepare an annual report to the oversight board and the Council, summarizing its activities and accomplishments. There will be no other oversight board or board of directors for the Center.

Operation of the Center shall include funds for a manager and for technical and clerical support in order to perform its stated functions. The fish passage manager will be selected based on his or her knowledge of the multiple purposes of the regional hydropower system, and of the water needs of fish and wildlife, as well as the ability to communicate and work with fish and wildlife agencies, tribes, the Council, project operators, regulators, and other interested parties, including members of the public. The manager shall be supervised by the contracting entity selected by Bonneville, and the contractor shall have the authority and obligation to conduct an annual performance review of the manager, after consultation with the oversight board.

Operation of the Center should include a person with expertise in analyzing storage reservoir operations and in-season impacts on resident fish from operations of the Federal Columbia River Power System. When carrying out its functions, the Center should consult with resident fish managers who have knowledge and expertise on reservoir operations and resident fish requirements.

The Center shall continue to provide an empirical database of fish passage information for use by the region, not just by fish and wildlife managers. No information collected by the Center, and no analyses by the Center, shall be considered proprietary. The oversight board and the fish and wildlife managers will ensure that the database conforms to appropriate standards for data management, including review of the database by an appropriate scientific or data review group. The Council may revise the functions of the Center as the region develops a comprehensive data management system.

15. Annual and In-Season Decision-making

- Through the biological opinions, the federal agencies have established a regional implementation structure for deciding on annual operation plans for fish and wildlife, in-season management of hydrosystem operations for fish and wildlife, and recommendations to Congress for funding for fish passage improvements at mainstem Columbia and Snake river hydropower projects. At present, this decision structure is insufficient to integrate fish and power considerations in a timely, objective and effective way, and it focuses on listed fish with less consideration for unlisted anadromous and resident fish species and wildlife. The Council recommends to the federal agencies that this implementation structure, which includes the Regional Forum Technical Management Team, System Configuration Team, and the Implementation Team, should be jointly sponsored or co-chaired by the Council and the federal agencies. The implementation structure should allow for effective participation in these considerations by the relevant federal agencies, the Council and states, the tribes of the Columbia River Basin and other affected entities in an open public forum. Decisions made in the Regional Forum should be transparent to regional participants.

The Council recommends that the Regional Forum teams should continue to broaden their focus to improve in-season hydrosystem operations decision-making, in the following ways:

- Include expertise in both biological and power system issues.

- Where appropriate, have the technical capability to analyze and present power supply forecasts, hydrosystem operational alternatives, and other power related issues. The Council should play a significant role in this.

- Have the technical capability to analyze differing hydrosystem operation proposals relative to impacts on salmon, steelhead, sturgeon and resident fish migration, survival, spawning, and rearing, and relative to impacts on wildlife.

- Regularly schedule meetings, as often as required, to deal with short-term, real-time decisions (e.g., weekly in-season migration issues), as well as middle and long-term issues (e.g., addressing longer-term reliability issues in a way that removes risk to providing operations to meet requirements of salmon).

- Operate with a defined set of decision-making criteria and hold participants accountable for the decisions they make, according to the established Regional Forum procedures.

16. Mid-Columbia Hydroelectric Projects

NOAA Fisheries and FERC have approved salmon and steelhead Habitat Conservation Plans (HCPs) developed by Douglas County PUD for its Wells Hydroelectric Project and by Chelan County PUD for its Rocky Reach and Rock Island Dams. The public utility districts developed these HCPs while working cooperatively with NOAA Fisheries, the U.S. Fish and Wildlife Service, the Washington Department of Fish and Wildlife, the Yakima Nation, the Colville Tribes and various local governments and non-governmental organizations. The HCPs call for implementation of a 50-year plan of fish bypass systems, spill at the projects, off-site hatchery programs and evaluations, and habitat restoration work in mid-Columbia tributary streams, with a goal of having no net impact on mid-Columbia salmon and steelhead runs. The Council recognizes the performance standards and the mainstem spill and bypass provisions as part of the baseline objectives and measures in the Columbia mainstem program. The Council expects the federal action agencies and others to work with the public utility districts to assist in successful implementation of the HCPs.

In relicensing and ESA review proceedings for its Priest Rapids and Wampum hydroelectric projects, Grant County PUD developed and obtained approval of a similar set of performance standards and operational and mitigation measures, including spill and bypass measures to benefit salmon and steelhead that pass above the projects and flow operations to benefit Hanford Reach fall chinook spawning and rearing below Priest Rapids. These operations have been described and reviewed in several multi-governmental agreements and biological opinions over the last decade. The Council recognizes the performance standards and these mainstem flow, spill and bypass provisions as part of the baseline objectives and measures in the Columbia mainstem program. The Council expects the federal action agencies and others to work with the public utility district to assist in successful implementation.

17. Hells Canyon Hydroelectric Project

Idaho Power Company's Hells Canyon hydropower complex, consisting of three hydroelectric projects on the mainstem Snake River, is currently undergoing FERC re-licensing and ESA Section 7 consultation. The Council will review the outcome of the FERC proceeding and completed biological opinion and, as appropriate, include in the program relevant provisions for the Hells Canyon Hydroelectric Project.

18. Reintroduction of Anadromous Fish in Blocked Areas

The Council recognizes and will monitor current efforts to reintroduce Pacific salmon and steelhead into blocked areas of the Columbia River Basin. Reintroduction of anadromous fish into blocked areas has the potential to increase the diversity, complexity capacity, and productivity of salmonid habitat. The Council will continue to evaluate the feasibility of salmon and steelhead reintroduction, consistent with the objectives in the appropriate subbasin plans.

VII. Subbasins

The preceding sections of this program address fish and wildlife needs at the basin and province level, and in the ocean, estuary, and mainstem. This section addresses the more than fifty subbasins within the ecological provinces.

During the period 2002-2004, fifty-seven subbasin plans were developed by subbasin planning entities consisting of fish and wildlife managers and other regional and local organizations. Each plan contains a vision and biological objectives for that subbasin and identifies specific actions necessary to protect, mitigate, and enhance fish and wildlife in that subbasin. The subbasin plans thus reflect local policies and priorities while remaining consistent with the basinwide vision, biological objectives, and strategies.

Subbasin plans provide the basis for review and funding of most fish and wildlife projects in this program. The Council expects that projects implemented through the program will be consistent with the goals, limiting factors, and actions indentified in the subbasin plans.

A. Elements of Subbasin Plans

- A 10-15 year management plan (adopted into the program);
- A subbasin assessment providing a description of historical and existing conditions;
- A clear and comprehensive inventory of existing projects and past accomplishments;

B. Implementing Plans at the Subbasin Level

Subbasin plans provide the context for project review for Bonneville funding each year as well as by the fish and wildlife agencies and tribes, the Independent Scientific Review Panel (ISRP) and the Council. The ISRP will use the subbasin plans to determine if projects support, and are consistent with, the plans. Subbasin plans also provide an opportunity to integrate and coordinate projects and programs funded by entities other than Bonneville, including Canadian entities in transboundary areas of subbasins.

C. Development and Submission of Subbasin Plans for Areas without Subbasin Plans

The Council supports the development of subbasin plans in areas where a plan does not exist. Subbasin plans proposed for adoption in the program, whether funded through the program or not, must undergo scientific review and must follow the guidelines set forth on the Council's website at www.nwcouncil.org. All subbasin plans proposed for adoption must be consistent with the Council's program and should take into account, to the extent possible, impacts from climate change and human population growth and movement.

The Northwest Power Act does not require consensus for a recommendation to be submitted to the Council. It is possible that different parties will submit different plans for the same subbasin. The level of support within a subbasin for a particular plan can be an important factor in gauging how well the plan meets the standards of the Act and whether the plan can be effectively implemented. Thus, the Council strongly encourages interested parties to work together.

The Act directs the Council to give special consideration to the recommendations of tribal, state, and federal fish and wildlife management entities when considering matters related to fish and wildlife. Therefore, subbasin plans should be developed with the participation of fish and wildlife managers with jurisdiction in the subbasin.

D. Updating Existing Subbasin Plans

The Council did not seek recommendations to update existing subbasin plans as part of this amendment process. The Council will consult with subbasin planners before the next amendment process to determine the need to update existing subbasin plans.

The Council recognizes work has continued in some subbasins to refine and update management plans. The Council therefore will accept recommendations to update existing subbasin management plans until November 1, 2010. This is a voluntary process and will not have specific, dedicated funding.

Recommendations to update existing management plans must be received by November 1, 2010. The Council will adopt or reject the recommended management plans by November 1, 2011.

Updated management plans must undergo science review and follow all Council guidelines as set forth on the Council's website.

E. Developing Subbasin Summary Tables

The Council received recommendations from the Fish and Wildlife agencies and tribes to incorporate templates summarizing the Council's subbasin plans into the Fish and Wildlife program.

The Council supports the development of subbasin plan summaries and will initiate a process, separate from the program amendment process, soliciting public comment on the summaries recommended by the fish and wildlife agencies and tribes. The Council seeks comment on any data gaps and inconsistencies including any new data based on recovery plans that have come into existence since the subbasin management plans were adopted.

While new subbasin data can only be incorporated via the formal program amendment processes set forth above in the sections titled "Development and Submission of Subbasin Plans for Areas without Subbasin Plans" and "Updating Existing Subbasin Plans", the

Council will review all comments and, depending on the nature of the public comments received, will consider posting the subbasin summaries on the Council's website.

VIII. Implementation Provisions

This program involves hundreds of projects and many millions of dollars per year in funding. A process is necessary to review, prioritize and select projects to be funded and to administer and track these projects over time. To the extent practicable, projects and actions should be coordinated throughout the region.

The procedures for implementing this program should ensure that planning results in on-the-ground actions and that those actions be reported to guide future decisions. The Council will use the procedures in this section to integrate Bonneville funding for this program with Endangered Species Act requirements and the collaborating programs of the states, tribes and federal and local governments. This section incorporates advances made in recent years to improve project selection and management practices for fiscal accountability and improved reporting.

A. Implementing Measures Recommended for 2008-2018

In 2007-08, Bonneville and other agencies of the federal government committed in a number of decisions, documents and agreements to fund an extensive set of actions over the next ten years to benefit listed and unlisted anadromous and resident fish across the Columbia River Basin. These include mainstem, estuary and tributary habitat, production, harvest, and monitoring actions committed to by the agencies as part of the consultation resulting in the 2008 Biological Opinion for the Federal Columbia River Power System and in the Columbia Basin Fish Accords ("Accords") executed with certain Indian tribes and states.

These actions are largely built on the mainstem and off-site mitigation foundations developed in the Council's program over the past 27 years, from the water management and passage measures in the original 1982 Program to the most recent adoption of subbasin plans. The Council recognizes these as measures that Bonneville and the other federal agencies have committed to fund and implement under Sections 4(h)(10)(A) and 4(h)(11) of the Northwest Power Act, even as these measures also address needs under other federal laws as well, such as the Endangered Species Act. [16]

The Council's program is broader in scope and covers a greater geographic area and a more extensive set of affected fish and wildlife populations than will benefit from the actions in the 2008 Biological Opinions and the Accords. The Council also received recommendations containing extensive lists of measures for implementation in the next

[16] Note on terminology: The Biological Opinion and the Accords refer to "actions." Other recommendations to the Council use a variety of terms to refer to the same type of thing, including "actions," "measures," "projects," and so forth. The term used in the Northwest Power Act, and thus used here in the program, is "measures." "Actions" recommended to the Council for inclusion in the Program are included as program "measures." Under the terminology of the Act, program "measures" are then implemented by "projects," subject to project review and proposed for funding and implementation by Bonneville.

5-10 years relating to these other areas of the program. These recommendations include habitat and production measures to benefit resident and anadromous fish in the subbasins of the Intermountain, Mountain Columbia and Middle and Upper Snake provinces and the Clearwater subbasin in the Mountain Snake, as well as measures to implement the wildlife elements of the Program. Again, these recommended measures appear to be based on the foundations already developed in the Council's program, including the adopted subbasin plans. The Council will work with recommending entities, Bonneville and others to shape the measures recommended for these other areas of the program into multi-year implementation plans similar to the implementation plans represented in the 2008 Biological Opinion and the Accords.

The Council accepts these recommendations as measures that are part of the fish and wildlife program. Implementation of all measures whatever their original source, must occur under the following conditions:

- All measures must be developed into detailed project proposals subject to review under Section 4(h)(10)(D) of the Northwest Power Act. First, all projects receive an independent science review of proposed work and, if on-going, of past performance. Second, the proposed projects and the science review report are subject to public review. Third, the Council develops funding recommendations for Bonneville based on the proposed projects, the program, the science review and the public review. The Council will review the project proposals carefully to ensure consistency with the Program's basinwide, mainstem, estuary and subbasin plans and provisions.

- Those responsible for implementing these projects must regularly report the results of implementation. Reporting must be sufficient for the purpose of evaluating the success of the projects, facilitating the science/performance review, and contributing appropriately to the program's broader monitoring and evaluation framework and reporting of program results. Reporting requirements must be included in the Bonneville contracts, and must include reporting in terms of performance metrics required by the Council.

- Implementation of these measures must allow for an on-going adaptive management approach and for future program amendment processes in which measures are modified or discontinued if not performing or no longer identified as a priority.

- Funding commitments already made by Bonneville and the other federal agencies to certain measures must not come at the expense of sufficient funding for other program priorities. For the program areas that do not yet carry Bonneville funding commitments, the Council will work with Bonneville and the project sponsors to estimate multi-year implementation budgets and secure funding commitments that assure adequate funding for these implementation plans.

The Fish and Wildlife Program is composed of measures for the purpose of protecting, mitigating, and enhancing fish and wildlife, including related spawning grounds and habitat, on the Columbia River and its tributaries. Bonneville has an obligation to use its

fund in a manner consistent with the measures in the Program. However, the Program is not a vehicle to guarantee funding for a particular project, entity, or individual. The fact that a specific measure is mentioned in the program or referenced by the program, as for example, in the Biological Opinions or Accords, does not by itself constitute a funding obligation for the associated project without further definition for implementation and review under Section 4(h)(10)(D) of the Northwest Power Act. Funding priorities have been determined systematically by the Council in the program, but final funding recommendations for projects in any particular year still depend on the outcome of independent science review, a program consistency review, public comment and a Council recommendation to Bonneville. This process will convert the priority measures in the program into implementation plans that provide specific guidance for Bonneville to ensure that its actions are consistent with the program.

B. Project Review Process

The Northwest Power Act directs the Council to oversee, with the assistance of the ISRP, a process to review projects proposed for funding by Bonneville. The ISRP will review proposed projects and make recommendations to the Council as to whether these proposals are based on sound scientific principles, benefit fish and wildlife, have a clearly defined objective and outcome with provisions for monitoring and evaluation of results, and are consistent with the priorities in the program. The ISRP also reviews the results of prior year expenditures. The Council must allow for public review and comment on the ISRP's recommendations. The Council will then make final recommendations to Bonneville on projects to be funded. In doing so, the Council must fully consider the ISRP's recommendations, explain in writing its reasons for not accepting ISRP recommendations, consider the impact of ocean conditions on fish and wildlife populations, and determine whether the projects employ cost-effective measures to achieve program objectives.

1. Objectives of Project Review

- Implement Bonneville's portion of the Council's Fish and Wildlife Program for anadromous fish, resident fish, and wildlife, including subbasin plans and other planning documents associated with the program.

- Allow the flexibility to incorporate Bonneville's ESA requirements and relevant agreements.

- Ensure review of projects (including those identified in the Biological Opinions and Accords) is consistent with the Northwest Power Act, section 4(h)(10)(D).

- Recognize differences in project types, specifically those with long-term funding commitments as compared to shorter term implementation (e.g., habitat). Each type may be set on different, but integrated, funding and review paths.

- Establish and communicate timelines, processes, and expectations.

- Focus on program performance by linking program spending with limiting factors.

- Increase transparency and accountability of project deliverables, durations, reporting requirements, performance metrics, and expectations.

2. Step Review Process

As one element of project review, the Council developed a Step Review process for review of major capital investments, including new artificial production programs. Step Review allows for review of scientific soundness, possible fish or wildlife benefits, environmental impacts, and design and fiscal considerations at appropriate stages in project development.

Step Review includes a thorough review by the ISRP and the Council at three different phases: master or conceptual planning, preliminary design, and final design. Projects do not move from one development step to the next without a favorable review. The Council intends the Step Review process be flexible and cost-efficient. Depending on the nature and status of the proposed project, the Council may allow for a review that combines two or more of the steps in a single submission and review, or for a submission and review that addresses just part of a step in the review process. The Step Review process is further described on the Council's website.

C. Project Reporting and Management

The overall guidelines for project reporting are described in the Monitoring, Evaluation, Research and Reporting section above. All projects must have implementation monitoring which must be reported to Bonneville within six months of completion of the project or annually in the case of multi-year projects. Bonneville, in its contracting process, should ensure that each project adheres to the relevant protocols and methods and satisfies the reporting and data management criteria described in this program or as adopted by the Council. In addition, the Council adopts by reference the reporting and project management standards of relevant NOAA Fisheries Biological Opinions for projects intended to meet the goals and objectives of those Biological Opinions.

D. Project Funding Priorities

The Northwest Power Act establishes Bonneville's obligation to fully mitigate for fish and wildlife impacts from the development and operation of the hydropower system. The Council recognizes its obligation, in turn, to construct a program that guides Bonneville's mitigation efforts. Work necessary to satisfy Bonneville's mitigation obligation must be sized appropriately during Bonneville's rate cases to provide equitable treatment to high

priority fish and wildlife projects regardless of whether or not they are identified in a Biological Opinion or in an Accord, while also accommodating yearly budget limitations.

The Council believes that final determination of a yearly direct program budget should occur no later than one year before the relevant projects are to be funded. Generally these projects' budgets are difficult to forecast more than three years in advance of initiation, so the budget is expected to be a rolling three year spending plan that will have a current spending estimate replaced by a new three year estimate every year.

1. Anadromous Fish, Resident Fish and Wildlife

The Council adopts the following funding principles to prioritize among the many needs to address fish and wildlife impacts throughout the basin:

- The Bonneville Power Administration will fulfill its commitment to "meet all of its fish and wildlife obligations."

- Funding levels should take into account the level of impact caused by the federally operated hydropower system. Other factors will also influence this determination including opportunities for off-site mitigation.

- Wildlife mitigation should emphasize addressing areas of the basin with the highest proportion of unmitigated losses.

- The Council will continue to evaluate the distribution of funding to provide fair and adequate treatment across the program. The Council maintains the current funding allocation for anadromous fish (70 percent), resident fish (15 percent), and wildlife (15 percent), until a new budget allocation is adopted.

2. Land and Water Acquisition Funds

Experience implementing this program has shown great advantages in being able to move quickly and flexibly to acquire interests in land and water rights for the purpose of protecting or enhancing fish and wildlife habitat. Often the opportunity for an important acquisition exists only for a short period of time, and often there is a substantial price advantage in being able to quickly close the transaction. The time and uncertainty of the current project selection process, and the procedural constraints on real estate acquisition by the federal agencies have made these transactions relatively difficult and more costly than necessary.

a. Water transaction program

Bonneville established a water transactions program in response to the 2000 Columbia River Basin Fish and Wildlife Program and the 2000 FCRPS Biological Opinion. Bonneville shall fund the continuation of the water transaction program to pursue water right acquisitions in subbasins where water quantity has been identified in a subbasin plan as a primary

limiting factor. The water transaction program will continue to use both temporary and permanent transactions for instream flow restoration. The water transaction program will coordinate with the fish and wildlife agencies, tribes and project sponsors to:

- Integrate instream water transactions with efforts to set and meet flow targets and habitat restoration goals;
- Integrate instream water transactions with efforts to address other ecological factors that are limiting fish habitat;
- Coordinate with Bonneville on other funding efforts addressing flow restoration to ensure consistency; and
- To the extent possible, consider the potential impact of climate change while making water transaction recommendations.

Bonneville funding of the water transaction program shall continue to accommodate associated transaction costs. In recognition of the timeframes necessary to successfully complete water transactions, Bonneville funding of the water transaction program within a given year shall be carried forward into the next year where a water right transaction has been proposed to the water transaction program but could not be completed in the same fiscal year. The water transaction program will seek closer integration of land and water protection acquisition activities.

b. Land acquisition fund

Bonneville shall fund a basinwide land acquisition program, which will include but not be limited to riparian easements and fee-simple acquisitions of land that protect watershed functions. The program will target land transactions that:

- Protect high quality fish and wildlife habitats that support critical life history stages of strong populations or species of special concern;
- Enhance natural ecosystem function and species diversity over the long term;
- When possible, integrate water transactions that provide clear and permanent protection of instream flows;
- Have willing and capable landowners; and
- Are directly supported by subbasin plans.

The Council will:

- Develop specific procedures and criteria for identification, review, and decision on whether to recommend proposals for land acquisitions. The criteria will be reviewed by the Independent Scientific Review Panel, but specific acquisitions would not require ISRP review.

- Develop provisions for reporting on monies spent, properties acquired, biological benefits, and consistency with program and subbasin objectives.
- Make all final recommendations regarding land and water acquisitions from the fund.

The Council will work with Bonneville and other interested parties to establish the details of the acquisition fund by July 1, 2009.

All acquisitions must be on a willing buyer, willing seller basis, consistent with state water law, and consistent with the other provisions of this program. Council members will be notified of all acquisition proposals under consideration by Bonneville. The fund will not be used for a proposed acquisition if both Council members from that state object to the acquisition.

The fund will not take title to acquisitions except on an interim basis, but will, for each transaction, identify an appropriate entity to hold the interest acquired. The fund will work with other efforts that are already underway to benefit fish and wildlife through acquisitions of land and may provide cost sharing or full funding for transactions that have been arranged by others. In appropriate circumstances, the fund may provide for the continuing payment of local taxes and fees on an acquisition.

Bonneville should adhere to the open and public process language found in the Northwest Power Act and should address concerns over additions to public land ownership and impacts on local communities, such as a reduction or loss of local government tax base or the local economic base, or consistency with local governments' comprehensive plans.

3. Science and Policy Conference

As described in the Monitoring, Evaluation, Research, and Reporting section of this program, the Council will co-sponsor a Columbia River Basin science and policy conference approximately every two years. Every other conference will include discussion of international issues surrounding Columbia River science and policy. The Council will work with the Columbia Basin Trust, an agency of the Province of British Columbia, in coordinating the international components of the conferences.

E. Program Reporting and Annual Report to Governors and Congress

Bonneville and the federal operating agencies will work cooperatively with the Council to produce an annual report which will provide an accounting of its fish and wildlife

expenditures and hydropower operation costs. The Council will also continue collaboration with all interested parties in the region and will report annually on how well projects taken under the program are being adapted to focus on high priority limiting factors and focal species in priority areas. The annual report will include a discussion of any data gaps, redundancies and recommended changes to achieve greater efficiencies.

F. Program Coordination

The Council benefits from the coordinated efforts of many groups, committees and organizations in implementing the Council's program on an ongoing basis. Continued coordination of various program elements is expected, supported, and in some cases financed by Bonneville. The elements below represent the key areas in which the Council seeks continued coordinated efforts from fish and wildlife managers and interested parties throughout the region. Coordination funding should be focused on the following activities that support program implementation:

- Data management (storage, management and reporting)
- Monitoring and Evaluation (framework and approach)
- Developing and tracking biological objectives
- Review of technical documents and processes
- Project proposal review
- Coordination of projects, programs and funding sources within subbasins
- Facilitating and participating in focus workgroups on program issues
- Information dissemination (technical, policy and outreach)

Any entity or organization receiving funding for coordination of program activities must develop a work plan detailing the coordination elements, objectives, deliverables and budget. All coordination work will be reviewed as part of the Council's project review process and as necessary, scientific and administrative review. The Council will recommend to Bonneville the level and type of coordination required to implement the program.

G. Coordination with Other Regional Programs

The Council will continue to pursue opportunities to implement the program in coordination with other federal, state, tribal, Canadian, and volunteer fish and wildlife restoration programs. The Council will continue to work with national programs that influence our work in the Basin, such as the Clean Water Act, and the Endangered Species Act.

The Council will coordinate with organizations that track and monitor data on non-native species distribution, climate change, and human population change at the Northwest regional scale. There are also ongoing efforts to monitor trends in Northwest habitat quality, ocean conditions and fish and wildlife that the Council will continue to track and participate in as described in the Monitoring, Evaluation, Research and Reporting section

above. Continued coordination with these larger efforts is important as their products and reports can directly influence our work in the Basin and help to guide decision-making.

H. In-lieu

Bonneville will only invoke the *in-lieu* provision under the Northwest Power Act when the expenditure, or potential expenditure, of Bonneville funds would clearly cause another funding source not to fund a project under this program.

I. Independent Scientific Review

All projects funded under this program are required by law to undergo review by an independent science panel. In addition, the program uses a second, related panel of scientists to provide advice to the region on key scientific issues.

Independent scientific review is an established tradition in research and development programs in the United States and much of the world. Independent scientific review can help decision-makers separate scientific variables from other considerations (political, economic, cultural, etc.) and help ensure that environmental decision-making reflects the best scientific knowledge. Independent scientific review for the fish and wildlife program is implemented by two groups: the Independent Scientific Review Panel (ISRP) and the Independent Scientific Advisory Board (ISAB). Each group provides unique services to the program. The ISRP reviews individual projects in the context of the program and makes recommendations on matters related to those projects. The ISAB provides an on-call scientific body for peer-review of various reports, plans, and issues affecting Columbia River Basin fish and wildlife.

The background and responsibilities of each group are provided below. A description of the administrative procedures follows.

1. The Independent Scientific Review Panel

Review Responsibilities

The 1996 amendment to the Northwest Power Act directed the Council to appoint an 11-member panel of independent scientists and additional peer review groups. These scientists provide advice and information regarding scientific aspects of projects that the Council may recommend for funding by Bonneville. The ISRP and peer review groups have responsibilities in three areas:

- Review projects proposed for Bonneville funding to implement the Council's program

The Northwest Power Act directs the ISRP to review annually projects that are proposed for Bonneville funding to implement the Council's program. The Act specifies the review standards that the ISRP is to use and the kinds of

recommendations to make to the Council. The Council must fully consider the ISRP's report prior to making its funding recommendations to Bonneville, and must explain in writing wherever the Council's recommendations differ from the ISRP's.

- Retrospective review of program accomplishments

The 1996 amendment also directs the ISRP, with assistance from the Scientific Peer Review Groups, to annually review the results of prior-year expenditures based upon the project review criteria and submit its findings to the Council. The retrospective review should focus on the measurable benefits to fish and wildlife made through projects funded by Bonneville and previously reviewed. The ISRP's findings should provide biological information for the Council's ongoing accounting and evaluation of Bonneville's expenditures and the level of success in meeting the objectives of the program, as described in the monitoring and evaluation section. Also as part of the ISRP's annual retrospective report, the ISRP should summarize major basinwide programmatic issues identified during project reviews.

- Review projects funded through Bonneville's reimbursable program

In 1998, the U.S. Congress' Senate-House conference report on the Fiscal Year 1999 Energy and Water Development Appropriations bill directed the ISRP to review the fish and wildlife projects, programs, or measures included in federal agency budgets that are reimbursed by Bonneville, using the same standards and making recommendations as in its review of the projects proposed to implement the Council's program. Further details of the ISRP's project review responsibilities are described above, in the section on project selection.

The ISRP is a standing group that conducts reviews throughout the year. Recommendations from the ISRP are reached by consensus. The ISRP may enlist Peer Review Group members to assist in reviews. From the pool of Peer Review Group members, the ISRP selects reviewers who have the appropriate expertise for the review at issue. The ISRP develops guidelines and criteria for reviews that describe lists of materials needed, site-visit protocols, and limits to reviewer and project sponsor communication.

2. The Independent Scientific Advisory Board

The Council and NOAA Fisheries established the 11-member ISAB to provide independent scientific advice to the region with the intent to avoid gridlock over scientific uncertainty, circumvent unnecessary additional research, and resolve conflicting advice and opinions on recovery issues and measures. In 2002, the Columbia River Indian Tribes joined the Council and NOAA Fisheries as partners in the ISAB's administrative oversight.

a. Review procedures

The ISAB is a standing group that meets regularly throughout the year. ISAB recommendations are reached by consensus. The ISAB may enlist ad hoc members to assist in reviews. Ad hoc members may include ISRP and Peer Review Group members. The ISAB conducts reviews in a manner consistent with its terms of reference and procedures policy.

b. ISAB Administrative Oversight Panel

A panel consisting of the chair of the Northwest Power and Conservation Council; the Regional Administrator of NOAA Fisheries and the Director of the Northwest Fishery Science Center as joint participants; and a senior representative of the Columbia Basin Indian Tribes provides administrative oversight for the ISAB and approves the annual work plan and budget. The Council will request an updated recommendation from the Columbia River Indian Tribes for tribal representation. The panel will make appointments to the ISAB from a list of nominees developed by the National Academy of the Sciences. Final selection of ISAB members is made by majority vote of the three members of the Administrative Oversight Panel.

c. Specific ISAB functions

- Evaluate the fish and wildlife program on its scientific merits in time to inform amendments to the fish and wildlife program and before the Council requests recommendations from the region**.**

- Evaluate NOAA Fisheries' recovery plans for Columbia River Basin stocks and aspects of the recovery process when requested**.**
  - Review the scientific and technical issues associated with efforts to improve anadromous fish survival through all life stages, based on adaptive management approaches**.**
  - Review and provide advice on priorities for conservation and recovery efforts, including research, monitoring and evaluation

- Provide scientific advice and review of topics identified as critical to fish recovery and conservation in the Columbia River Basin.

- Evaluate the scientific merits of plans and measures proposed to ensure satisfaction and continuation of tribal treaty fishing rights in the Columbia River Basin and other tribal efforts to restore and manage fish and wildlife resources.

- Provide specific scientific advice on topics and questions requested from the region or the ISAB itself and approved by the Oversight Panel by majority vote. Fish and wildlife agencies and others may submit questions to the ISAB through the Oversight Panel. The ISAB may also identify questions and propose reviews. The

Oversight Panel, in consultation with the ISAB, reviews these questions in a timely manner and decides which are amenable to scientific analysis, are relevant to the Tribes', Council's, and NOAA Fisheries' programs, and fit within the ISAB's work plan. Many questions pertaining to the recovery of the Columbia River ecosystem contain both scientific and policy aspects. The ISAB should confine itself to dealing only with scientific aspects of issues.

3. Administration of the Independent Scientific Review Panel, the Scientific Peer Review Groups, and the Independent Scientific Advisory Board

a. Membership

The ISRP and the ISAB shall each be composed of eleven members. Peer Review Groups shall be composed of a pool of scientists sufficient in size and expertise to assist the ISRP in its review responsibilities. To ensure coordination and avoid redundancy of efforts between the ISRP and the ISAB, at least two members of the ISRP shall be on the ISAB. Other ISAB members should be considered for appointment to the Peer Review Group.

Membership for each group shall include, to the extent feasible, scientists with expertise in Columbia River anadromous and resident fish ecology, statistics, wildlife ecology, ocean and estuary ecology, fish husbandry, genetics, geomorphology, social and economic sciences, and other relevant disciplines. There should be a balance between scientists with specific knowledge of the institutions, history, geography, and key scientific issues of the Columbia River Basin and those with more broad and diverse experience. Members should have a strong record of scientific accomplishment, high standards of scientific integrity, the ability to forge creative solutions to complex problems, and a demonstrated ability to work effectively in an interdisciplinary setting.

ISRP and ISAB membership terms are normally for three years, not to exceed two terms. Term limits of the members are staggered to ensure continuity of effort. Peer Review Group members do not have specific terms, but the ISRP and the Council will review the pool of Peer Review Group members on an annual basis and update it when appropriate.

b. Appointment procedures

The appointment procedures to fill vacancies on the ISAB and the ISRP, and to augment the pool of Peer Review Group members, follow three steps. The first two steps are the same for each group. First, the Council, in cooperation with the ISAB Oversight Panel, invites the region to submit nominations. Second, the National Academy of Sciences, assisted by the National Research Council, evaluates the credentials of the nominees,

submits additional nominees if necessary, and recommends a pool of qualified candidates for potential appointment. This pool of candidates should span the areas of needed expertise and meet the membership criteria for the ISRP and ISAB. The pool should be robust enough to last through several rounds of appointments. The third step, the appointment procedure, varies for the ISAB and ISRP. The ISAB Oversight Panel appoints ISAB members. The Council alone appoints ISRP and Peer Review Group members.

c. Conflict of interest

ISAB, ISRP and Scientific Peer Review Group members are subject to the conflict of interest standards that apply to scientists performing comparable work for the National Academy of Sciences. At a minimum, members with direct or indirect financial interest in a project shall be recused from review of, or recommendations associated with, such a project. The Council has approved a Conflict of Interest Policy that satisfies the needs of the program, applies to the ISRP and the ISAB, and is based on the National Academy of Science's standards.

IX. Tribal Rights, Water Rights, and the Role of Fish and Wildlife Agencies

A. Recognition of Tribal Role

The Council recognizes that the Indian tribes in the Columbia River Basin have vital interests directly affected by activities covered in this program. These Indian tribes are sovereigns with governmental rights over their lands and people, and with rights over natural resources that are reserved by or protected in treaties, executive orders, and federal statutes. The United States has a trust obligation toward Indian tribes to preserve and protect these rights and authorities. Nothing in this program is intended to affect or modify any trust or treaty right of an Indian tribe. The Council also recognizes that implementation of this program will require significant interaction and cooperation with the tribes. The Council commits to work with the tribes in a relationship that recognizes the tribes' interests in co-management of affected fish and wildlife resources and respects the sovereignty of tribal governments.

B. Water Rights

As provided by the Northwest Power Act, nothing in this program shall affect the rights or jurisdictions of the United States, the states, Indian tribes, or other entities over waters of any river or stream or over any groundwater resources. Nor shall anything in this program be construed to alter or establish the respective rights of the United States, the states, Indian tribes, or any person with respect to any water or water-related right.

C. Role of Fish and Wildlife Agencies

The Northwest Power Act envisions a strong role for fish and wildlife agencies and Indian tribes in developing the provisions of this program. In sections 4(h)(6)(A) and 4(h)(6)(D) of the Act, the Council is directed to include program measures that it determines "complement the existing and future activities of the Federal and the region's State fish and wildlife agencies and appropriate Indian tribes" and which will "be consistent with the legal rights of appropriate Indian tribes in the region."

X. Appendix

The Appendix, which follows in this volume, is legally part of the fish and wildlife program. The provisions of this Appendix have been formally adopted by the Council and changes to this Appendix require formal amendment of the fish and wildlife program.

The contents of the Appendix are:

A. Glossary and Acronyms

B. Hydroelectric Development Conditions: This section contains conditions to protect fish and wildlife applicable to FERC-licensed projects and also designates certain areas as Protected Areas, in which the Council recommends there be no new hydroelectric projects developed.

C. Wildlife Provisions: These provisions consist of tables setting forth wildlife mitigation priorities for the Lower Columbia Subbasin, Upper Columbia Subbasin, and Snake River Subbasin and a table identifying the losses due to hydropower construction at federal dams in the Columbia River Basin. The provisions also contain mitigation considerations in dam licensing and relicensing decisions.

D. Findings on the Recommendations submitted to the Council in 2008 for Amendments to the Fish and Wildlife Program. The findings are not contained in this volume. They are posted on the Council's website.

E. Analysis of the Adequacy, Efficiency, Economy and Reliability of the Power System.

F. Estimates of Hydropower-Related Losses.

Appendix A: Glossary and Acronyms

Act - See Northwest Power Act.

Action Agencies - U. S. Army Corps of Engineers, the Bonneville Power Administration and the U. S. Bureau of Reclamation that own or operate the Federal Columbia River Power System.

Adaptive Management - A scientific policy that seeks to improve management of biological resources, particularly in areas of scientific uncertainty, by viewing fish and wildlife program actions (projects) as vehicles for learning. Projects that implement the program are designed and implemented as experiments so that even if they fail, they provide useful information for future actions. Monitoring and evaluation are emphasized so that the interaction of different elements of the system is better understood.

Alluvial - Detrital material, such as clay, sand, and gravel that is deposited along the river or stream channel.

Anadromous Fish - Fish that hatch in freshwater, migrate to the ocean, mature there and return to freshwater to spawn; for example, Chinook salmon, Pacific lamprey, and or steelhead salmon.

Other Federal Laws - A term usually intended to imply the Endangered Species Act and the Clean Water Act.

Artificial Production - See artificial propagation.

Artificial Propagation - Any assistance provided by human technology to animal reproduction. In the context of Pacific salmon, this assistance may include, but is not limited to, spawning and rearing in hatcheries, stock transfers, creation of spawning habitat, egg bank programs, captive broodstock programs and cryopreservation of gametes.

B-run Steelhead - Summer steelhead crossing Bonneville Dam after August 25.

Baseline Monitoring - In the context of subbasin, recovery or other program planning, baseline monitoring is done to establish historical and/or current conditions against which progress (or lack of progress) can be measured. The lack of baseline monitoring should not be a reason to take no actions under this program. Enough baseline information should be gathered as quickly as possible to be reasonably certain the actions proposed are addressing priority limiting factors to benefit focal species in priority reaches.

Basinwide - An activity or an issue that extends over the entire Columbia River watershed.

Biological Diversity - Biological diversity within and among populations of salmonids is generally considered important for three reasons. First, diversity of life history patterns is associated with a use of a wider array of habitats. Second, diversity protects a species against short-term spatial and temporal changes in the environment. And third, genetic diversity is the so-called raw material for adapting to long-term environmental change. The latter two are often described as nature's way of hedging its bets – a mechanism for dealing with the inevitable fluctuations in environmental conditions – long and short term. With respect to diversity, more is better from an extinction-risk perspective.

Biological Indicators - The general measures of success for the regional effort that in some cases will extend beyond the narrow responsibility of the federal hydropower system. These indicators will focus on fish populations, productivity, fish survival, artificial production, predation, harvest, and wildlife habitat.

Biological Objectives - The initial assessments along with the vision will guide the focus of the biological objectives. Biological objectives should clearly describe physical and biological changes needed to achieve the vision in a quantifiable fashion. They will serve as a benchmark to evaluate progress toward the subbasin vision and should have measurable outcomes. Biological objectives should (1) describe and quantify the degree to which the limiting factors will be improved, and (2) describe and quantify changes in biological performance of populations that will result from actions taken to address the limiting factors.

Biological Opinion - A document that is the product of formal consultation, stating the opinion of the Service on whether or not a Federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

Biological Performance - The responses of populations to habitat conditions, described in terms of capacity, abundance, productivity, and life history diversity.

Biological Potential - The biological potential of a species means the potential capacity, productivity and life history diversity of a population in its habitat at each life stage.

Blocked areas - Areas in the Columbia River Basin where hydroelectric projects have created permanent barriers to anadromous fish runs. These include the areas above Chief Joseph and Grand Coulee dams, the Hells Canyon Complex and other smaller locations.

Bonneville Power Administration (Bonneville) - The sole federal power marketing agency in the Northwest and the region's major wholesaler of electricity. Created by Congress in 1937, Bonneville sells power to public and private utilities, direct service customers, and various public agencies in the states of Washington, Oregon, Idaho, Montana west of the Continental Divide, (and parts of Montana east of the Divide) and smaller adjacent areas of California, Nevada, Utah, and Wyoming. The Northwest Power Act charges Bonneville with additional duties related to energy conservation, generating resource acquisition, and fish and wildlife.

Bureau of Reclamation, U.S. Department of the Interior - An agency that administers some parts of the federal program for water resource development and use in western states. The Bureau of Reclamation owns and operates a number of dams in the Columbia River Basin, including Grand Coulee, Hungry Horse, and several projects on the Yakima River.

Bypass system - A channel or conduit in a dam that provides a route for fish to move through or around the dam without going through the turbine units.

Carrying capacity - The number of individuals of one species that the resources of a habitat can support. That is, the upper limit on the steady-state population size that an environment can support. Carrying capacity is a function of both the populations and their environments.

Clean Water Act - The Act employs a variety of regulatory and nonregulatory tools to regulate direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. The goal is to restore and maintain the chemical, physical, and biological integrity of the nation's waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."

Climate change (also referred to as "global climate change") - The term "climate change" is sometimes used to refer to all forms of climatic inconsistency, but because the Earth's climate is never static, the term is more properly used to imply a significant change from one climatic condition to another. In some cases, climate change' has been used synonymously with the term, "global warming;" scientists, however, tend to use the term in the wider sense to also include natural changes in climate.

Climate - The average weather (usually taken over a 30-year time period) for a particular region and time period. Climate is not the same as weather, but rather it is the average pattern of weather for a particular region. Weather describes the short-term state of the atmosphere. Climatic elements include precipitation, temperature, humidity, sunshine, wind velocity, phenomena such as fog, frost, and hail storms, and other measures of the weather.

Columbia Basin Project - A multipurpose development on the Upper Columbia River in central Washington. The major facilities of the Columbia Basin Project are Grand Coulee Dam and its impoundment, Lake Roosevelt, the Grand Coulee Power plant complex, the pump/generating plant, Banks Lake, and Potholes Reservoir. In addition, the project includes a well-developed system of canals, dams, reservoirs, drains, wasteways, laterals, and other structures. Current irrigated acreage is about 671,500 acres.

Columbia River Basin Fish Accords - The Accords are agreements between the action agencies, several tribes and two states, which are 10-year action agency commitments for projects to benefit fish affected by the FCRPS. The focus is on ESA-listed anadromous fish and actions to support the FCRPS Biological Opinion. The accords also include some other actions for non-listed fish.

Columbia River Basin - The Columbia River and its tributaries.

Columbia River Hatchery Reform Project of 2006 - Congressionally mandated project to develop a performance-based management approach that serves to improve tribal, state and federal management of Columbia River Basin hatcheries in meeting conservation and production goals. The project is implemented through a Hatchery Scientific review Group.

Columbia River Treaty - The Treaty between the United States of America and Canada Relating to Cooperative Development of the Water Resources of the Columbia River Basin, 1964. The Canadian Entity (B.C. Hydro) and the U.S. Entity (represented by the U.S. Army Corps of Engineers and Bonneville Power Administration) are responsible for ensuring the provisions of the Columbia River Treaty are fulfilled. It became effective on September 16, 1964. The treaty also authorized the construction of Libby Dam on the Kootenai River in Montana, which creates a reservoir that extends into British Columbia.

Compliance Monitoring - Monitoring to determine whether a specific performance standard, environmental standard, regulation, or law is met. Not commonly required for this program, but when conducted for other purposes this kind of monitoring often generates results of use to the program. Monitoring for dissolved gas levels is an example.

Conservation easement - A legal document that provides specific land-use rights to a secondary party. A perpetual conservation easement usually grants conservation and management rights to a party in perpetuity.

Consultation - All Federal agencies must consult with the U.S. Fish and Wildlife Service or National Marine Fisheries Service when any activity permitted, funded, or conducted by that agency may affect a listed species or designated critical habitat, or is likely to jeopardize proposed species or adversely modify proposed critical habitat. There are two stages of consultation: informal and formal.

Coordination - Within the program coordination is not an action or a subject by itself -- it is incidental to the need to make progress on a substantive program area that requires the coordinated work of more than one entity. What type of “coordination” needs to occur in any particular instance is wholly dependent on the work that needs to be accomplished and the particular entities identified that need to work together to accomplish it.

Corps of Engineers, U.S. Department of the Army (Corps) - An agency with the responsibility for design, construction, and operation of civil works, including multipurpose dams and navigation projects.

Cost-effective - As defined in the Northwest Power Act, with regard to actions that implement the Council’s fish and wildlife program, where equally effective alternative

means of achieving the same sound biological objective exist, the cost-effective alternative is the one with the lowest economic cost.

Current Condition - See baseline monitoring.

Diversion screens - Wire mesh screens placed at the point where water is diverted from a stream or river. The screens keep fish from entering the diversion channel or pipe.

Direct mortality - Direct mortality is that which occurs directly from some event along the downriver passage through (or around) the hydropower system, that is, mortality directly associated with the hydrosystem.

Dissolved gas - The amount of chemicals normally occurring as gases, such as nitrogen and oxygen that are held in solution in water, expressed in units such as milligrams of the gas per liter of liquid. Supersaturation occurs when these solutions exceed the saturation level of the water (beyond 100 percent).

Drawdown - The release of water from a reservoir for power generation, flood control, irrigation or other water management activity.

Ecological function - The role, or function, that species have within the community or ecosystem in which they occur.

Ecosystem - The set of species and biological communities, including all biotic and abiotic factors and their interactions, existing in a particular environment and geographic area.

Effectiveness Monitoring - Monitoring set up to test cause-and-effect hypotheses about actions: Did the management actions achieve their direct effect or goal? For example, did fencing a riparian area to exclude livestock result in recovery of riparian vegetation?

Endangered - The classification provided to an animal or plant in danger of extinction within the foreseeable future throughout all or a significant portion of its range.

Endangered Species Act of 1973 as amended - Federal legislation intended to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved, and provide programs for the conservation of those species, thus preventing extinction of native plants and animals.

Environmental Characteristics - The environmental conditions or changes sought to achieve the desired changes in population characteristics.

Environmental Impact Statement - A report that states the potential environmental effects of federally controlled projects (e.g., through federal licensing, funding or undertaken by the federal government) that may impact the environment. Environmental

impact statements are required by Section 102(2) (C) of the National Environmental Policy Act of 1969 (PL91-190).]

Environmental Risk Assessment - Process to identify and evaluation of the potential negative impacts of proposed actions impacts on the environment.

Escapement - The numbers of salmon and steelhead that return to a specified point of measurement after all natural mortality and harvest have occurred. Spawning escapement consists of those fish that survive to spawn.

Estuary - The part of the wide lower course of a river where its current is met and influenced by the tides. In the both the vertical and horizontal planes, the estuary is a complex transitional zone without sharp boundaries between freshwater and marine habitats.

Evolutionarily Significant Unit (ESU) - A distinct population segment for Pacific salmon (the smallest biological unit considered to be a "species" under the Endangered Species Act). A population will be considered an ESU if: (1) it is substantially reproductively isolated from other co specific units, and (2) it represents an important component in the evolutionary legacy of the species.

Extinction - The natural or human-induced process by which a species, subspecies or population ceases to exist.

Extirpated species - A species no longer surviving in regions that were once part of their range.

FCRPS - Acronym for the Federal Columbia River Power System, which comprises 31 federal dams and one non-federal nuclear power plant in the Columbia River Basin. The Bonneville Power Administration sells the output of the FCRPS. The FCRPS comprises 14 Federal multipurpose hydroprojects. The 12 projects operated and maintained by the Corps are: Bonneville, The Dalles, John Day, McNary, Chief Joseph, Albeni Falls, Libby, Ice Harbor, Lower Monumental, Little Goose, Lower Granite, and Dworshak dams. Reclamation operates and maintains the following FCRPS projects: Hungry Horse Project and the Columbia Basin Project, which includes Grand Coulee Dam. The FCRPS consultation also includes the mainstem effects of other Reclamation projects in the Columbia Basin.

Federal Energy Regulatory Commission (FERC) - The Commission issues and regulates licenses for construction and operation of non-federal hydroelectric projects and advises federal agencies on the merits of proposed federal multipurpose water development projects.

Fish Guidance Efficiency - The proportion of juvenile fish passing into the turbine intakes that are diverted away from the turbines and into bypass facilities.

Fish and wildlife Agencies - This category includes the Fish and Wildlife Service, U.S. Department of the Interior; the Idaho Department of Fish and Game; the Montana Department of Fish, Wildlife and Parks; the National Marine Fisheries Service of NOAA Fisheries, a division of the U.S. Department of Commerce; the Oregon Department of Fish and Wildlife; and the Washington Department of Fish and Wildlife.

Fish and Wildlife Lost Opportunity - New or ongoing projects that respond to a limited opportunity to benefit the fish and wildlife resource and that opportunity will be permanently lost if the requested budget increase and associated work is not approved.

Passage efficiency - The percentage of the total number of fish that pass a dam without passing through the turbine units.

Floodplain - Land adjacent to stream or river that is periodically flooded.

Flow(s) - The rate at which water passes a given point in a stream or river, usually expressed in cubic-feet per second (cfs).

Flow augmentation - Increased flow from release of water from storage dams

Forebay - The part of a dam's reservoir that is immediately upstream of the powerhouse.

Fry - The young of various fishes. The salmon fry or alevins that survive to emerge from the gravel do so as fry. Depending on the species, fry immediately begin to migrate downstream or reside near in the natal stream for months or years before migrating to the sea.

Gas supersaturation - The overabundance of gases in turbulent water, such as at the base of a dam spillway. Can cause a fatal condition in fish similar to the bends.

Genetic diversity - All of the genetic variation within a species. Genetic diversity includes both genetic differences among individuals in a breeding population and genetic differences among different breeding populations.

Genetic integrity - The ability of a breeding population or group of breeding populations to remain adapted to its natural environment.

Habitat - The locality or external environment in which a plant or animal normally lives and grows. As used in this program, habitat includes the ecological functions of the habitat structure.

Habitat Conservation Plan - An agreement between the Secretary of the Interior and either a private entity or a state that specifies conservation measures that will be implemented in exchange for a permit that would allow taking of a threatened or endangered species.

Habitat unit (HU) - A value derived from multiplying the HSI for an evaluation species by the size of the areas for which the HSI was calculated (HU = HSI x size of habitat)

Harvest - The total number or poundage of fish caught and kept from an area over a period of time. Note that landings, catch, and harvest are different.

Harvest management - The process of setting regulations for the commercial, recreational and tribal fish harvest to achieve a specified goal within the fishery.

Harvest Rates - The portion of an ESU that is expected to be harvested based on the management goals set by the fish managers.

Hatchery - An artificial propagation facility designed to produce fish for harvest or spawning escapement. A conservation hatchery differs from a production hatchery in that it specifically seeks to supplement or restore naturally spawning populations.

Hatchery Influence - The effect of released hatchery fish on wild fish, such as competition, productivity, genotype, phenotype, behavior.

Hatchery Population - A population of fish that depends on spawning, incubation, hatching, or rearing in a hatchery or other artificial propagation facility.

Hydroelectric power or hydropower - The generation of electricity using falling water to turn turbo-electric generators.

Hydrosystem - The hydroelectric dams on the Columbia River and its tributaries.

Implementation indicators - Record accomplishments for actions like enhancing water flows in tributaries or improving riparian habitat that are believed to produce desirable biological results.

Implementation Monitoring - Monitoring conducted to determine whether an activity was performed and completed as planned. All actions must have implementation monitoring which must be reported to Bonneville. In some cases this may be as simple as a photo point and a brief description.

Implementation Team - A policy-level work group within the National Marine Fisheries Service's Regional Forum that provides advice on the implementation of the FCRPS biological opinion on the effects of the federal dams in the Columbia River basin. The IT oversees the Technical Management Team, which deals with hydrosystem operations, the System Configuration Team, which deals with structural changes at the mainstem federal dams to improve fish passage, and the Water Quality Team, which addresses water quality issues at the mainstem dams.

Irrigation - Water diverted from surface water bodies or pumped from groundwater and applied to agricultural lands though ditches, canals, dikes, pumps, pipes and other water

conveyance systems for the purpose of raising crops in areas that do not have sufficient moisture under natural conditions. Irrigation accounts for most surface water withdrawals in the Columbia River Basin. Total irrigation withdrawals for the Columbia River Basin in the U.S. are about 33 MAF of water each year; about 19 MAF of this withdrawn water returns eventually to the river as return flows and is available for reuse. Irrigation depletions are less than 7 percent of the Columbia River's observed outflow. Total irrigated acreage in the United States portion of the basin in 1990 was between 6.9 and 7.1 million acres. The area of land irrigated in any single year varies from 10 to 20 percent with water supply and the general economy

Irrigation screens - Screens using wire mesh placed at the point where water is diverted from a stream or river. The screens keep fish from entering the diversion channel or pipe.

Jacks - Small reproductively mature male salmon that return to spawn after spending only one winter in the marine environment.

Juvenile - Fish from approximately one year of age until sexual maturity.

Kelt - Steelhead that return to the sea after spawning and may return to natal streams to spawn again.

Kokanee - A land-locked form of sockeye salmon.

Lamprey or Pacific lamprey - Pacific lamprey are dark bluish gray or dark brown in color and can reach 30 inches in length and weigh over a pound. Pacific lamprey are anadromous. They enter freshwater streams of the Columbia River Basin from July to October and spawn the following spring. Juvenile lamprey will stay burrowed in the substrate of the streams for 4 to 6 years, During its ocean phase of two to three years, Pacific lamprey are scavengers, parasites, or predators on larger prey such as salmon and marine mammals.

Large Woody Debris - Material (such as a log, tree, or branches) with a diameter greater than 10 cm and a length greater than 1 meter in the stream.

Life history diversity - The multitude of life history pathways (temporally and spatially connected sequences life history segments) available for the species to complete its life cycle.

Limiting Factors - Physical, biological, or chemical features (e.g., inadequate spawning habitat, high water temperature, insufficient prey resources) experienced by the fish that result in reductions in abundance, productivity, spatial structure, or diversity. Key limiting factors are those with the greatest impacts on a population's ability to reach its desired status.

Listed species - A species, subspecies, or distinct vertebrate population segment that has been added to the Federal lists of Endangered and Threatened Wildlife and Plants as they

appear in sections 17.11 and 17.12 of Title 50 of the Code of Federal Regulations (50 CFR 17.11 and 17.12).

Lower Snake River Fish and Wildlife Compensation Plan - Authorized by the Water Resources Development Act of 1976 to mitigate for fish and wildlife losses caused by construction and operation of the four lower Snake River dams.

Mainstem - The main channel of the river in a river basin, as opposed to the streams and smaller rivers that feed into it. In the fish and wildlife program, mainstem refers to entirety of the main channels of the Columbia and Snake rivers.

Mainstem passage - The movement of salmon and steelhead around or through the dams and reservoirs in the Columbia and Snake rivers.

Mainstem survival - The proportion of anadromous fish that survive passage through the dams and reservoirs while migrating in the main channels of the Columbia and Snake rivers.

Management indicators - Track progress in achieving management goals such as implementing hatchery standards or securing positive scientific reviews.

Management plans - The management plan sets forth desired direction for the subbasin on a hierarchical approach, taking into account the science, local conditions, concerns, Treaty rights, and applicable law and policy. It is where the science and the social aspects come together. The hierarchical approach begins with a *vision* for the subbasin, then outlines *biological objectives* describing the desired environmental conditions, and then identifies a set of *strategies* to achieve the objectives. In addition, the management plan includes a *monitoring and evaluation plan* for the strategies that may be implemented. Plans should have a 10-15 year horizon recognizing that additional information and analysis may indicate the need for periodic refinement.

Metadata - Data exist in two forms -- primary data and metadata. Primary data are numbers or counts -- for example, the number of adult fish counted in a given time period, interval, and location. Metadata describe how those numbers were obtained, including the monitoring design (selection of times and locations), objectives, and methods.

Migration corridor - The habitat pathway an animal uses to move from one place to another.

Mid-Columbia dams - Dams owned by the mid-Columbia Public Utility Districts. They include Wells, Rocky Reach, Rock Island, Wanapum and Priest Rapids dams.

Mid-Columbia Public Utility Districts (PUDs) - PUD No. 1 of Grant County, PUD No. 2 of Chelan County and PUD No. 1 of Douglas County.

Mixed-stock fishery - A harvest management technique by which different species, strains, races, or stocks are harvested together.

Native Species - A population of fish that has not been substantially impacted by genetic interactions with non-native populations, or by other factors, that persists in all or part of its original range. In limited cases a native population may also exist outside its original range (e.g. in a captive broodstock program).

Natural fish - A fish that has spent essentially all of its life-cycle in the wild and whose parents spawned in the wild.

Natural production - Spawning, incubating, hatching, and rearing fish in rivers, lakes, and streams without human intervention.

Naturally spawning populations - Populations of fish that have completed their entire life cycle in the natural environment and may be the progeny of wild, hatchery or mixed parentage.

Nez Perce Water Rights Settlement - The Settlement resulted in Idaho authorizing up to 427,000 acre-feet of water for flow augmentation, plus an authorization an additional 60,000 acre-feet for the same purpose through 2034. These provisions increase the long-term probability of obtaining 427,000 acre-feet, and in some years providing as much as 487,000 acre-feet. The Nez Perce Tribal component provides for use of 200,000 acre-feet of water stored in Dworshak Reservoir for flow augmentation and temperature control (cooling) in the lower Snake River in August and September.

Northern Pikeminnow - A giant member of the minnow family, the Northern Pikeminnow (formerly known as Squawfish) is native to the Columbia River and its tributaries. Studies show a Northern Pikeminnow can eat up to 15 young salmon a day.

Northwest Power Act - The Pacific Northwest Electric Power Planning and Conservation Act (16 U.S.C. 839 et seq.), which authorized the creation of the Northwest Power Planning Council. The Act directs the Council to develop the Columbia River Basin Fish and Wildlife Program to protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat on the Columbia River and its tributaries, to establish an Independent Scientific Review Panel to review projects implementing this program that are proposed for funding by Bonneville, and to make final recommendations to Bonneville on implementation of projects.

Non-native species - Introduced species (especially invasive exotic species). These can have a distinct advantage in competing with native species because they escape a large percentage of the pathogens and parasites from their native range and are slow to pick up new infections in their newly invaded range. There is convincing evidence that non-native species are continuing to increase in the Columbia Basin aquatic habitats, and climate change is likely to further accelerate their expansion, often at the expense of native species.

Nutrient - An element (oxygen, nitrogen and phosphorus) or compound required for the growth and development of an organism.

Nutrient Cycling - Process by which nutrients are continuously transferred between organisms within an ecosystem.

Ocean type - A juvenile fish that migrates quickly from its natal stream to the ocean and does not spend a winter in fresh water**.**

Off-site mitigation - The improvement in conditions for fish or wildlife species away from the site of a hydroelectric project that had detrimental effects on fish and/or wildlife, as part or total compensation for those effects. An example of off-site mitigation is the fish passage restoration work being conducted in the Yakima River Basin for the detrimental effects caused by mainstem hydroelectric projects.

***Oncorhynchus* -** The genus containing the five species of salmon and steelhead found within the Columbia Basin: Chinook (*O. tshawytscha* also known as tyee or king), chum (*O. keta* also known as dog or calico), coho (*O. kisutch* also known as silver), sockeye (*O. nerka* also known as red, blueback, silver trout and in the resident form as kokanee) and steelhead (*O. mykiss* and known as rainbow in the resident form).

Operational losses - The direct wildlife losses caused by the day-to-day fluctuations in flows and reservoir levels resulting from the operation of the hydrosystem.

Parr - Salmon and steelhead fry that linger in fresh water streams become parr, and after 1 to 5 years will smoltify and then migrate to the ocean.

Passage - The movement of migratory fish through, around, or over dams, reservoirs, and other obstructions in a stream or river.

Performance measures, standards and targets - Performance measures are metrics that are monitored and evaluated relative to performance standards (benchmarks) and performance targets (longer-term goals) to assess progress of actions and inform future decisions.

Pinniped - Any of an order or suborder Pinnipedia of aquatic carnivorous mammals with all four limbs modified into flippers. California sea lions, Steller sea lion and harbor seals are salmon, steelhead, lamprey and sturgeon predators that congregate annually below Bonneville Dam.

Piscivorous - Fish-eating.

PIT tags - Passive Integrated Transponder tags are used for identifying individual salmon for monitoring and research purposes. This miniaturized tag consists of an integrated microchip that is programmed to identify individual fish. The tag is inserted into the body cavity of the fish and decoded at selected monitoring sites.

Plume - The area of the Pacific Ocean that is influenced by discharge from the Columbia River, up to 500 miles beyond the mouth of the river.

Population
A group of organisms belonging to the same species that occupy a well-defined locality and exhibit reproductive continuity from generation to generation.

Predator - An animal that lives by killing and eating other animals for food.

Productivity - A measure of a population's ability to sustain itself or its ability to rebound from low numbers. The terms "population growth rate" and "population productivity" are interchangeable when referring to measures of population production over an entire life cycle. Productivity can be expressed as the number of recruits (adults) per spawner or the number of smolts per spawner.

Quasi-extinction Threshold (QET50) - This is the point at which a population has become too small to reliably reproduce itself, even though there may be a few fish remaining. Since there is debate about the exact population level at which this condition occurs, several possible levels (50, 30, 10, 1) are considered. Results from short-term quasi-extinction probability modeling are used to help assess near-term (24-year) extinction risk.

Range - Species have areas of occurrence (ranges) that are limited by suitable climatic conditions, especially temperature and moisture availability. Thus, as temperature and precipitation patterns change, species will disappear from parts of their former ranges that have become unsuitable for their existence, and they may appear in new areas where they were formerly absent. Whether or not the ranges move or expand depends on the ability of organisms to disperse or migrate to the areas that become suitable.

Rearing - The juvenile life stage of anadromous fish spent in freshwater rivers, lakes, and streams before they migrate to the ocean. Can also be used to refer to resident species (i.e., trout) in a production facility.

Reclamation - United States Bureau of Reclamation.

Recovery/restoration - The reestablishment of a threatened or endangered species to a self-sustaining level in its natural ecosystem (i.e., to the point where the protective measures of the Endangered Species Act are no longer necessary).

Recovery program (plan) - A strategy for conserving and restoring a threatened or endangered species. An Endangered Species Act recovery plan refers to a plan prepared under section 4(f) of the Act and approved by the Secretary, including: (1) A description of site-specific management actions necessary for recovery; (2) objective, measurable criteria that can be used as a basis for removing the species from threatened or endangered status; and (3) estimates of the time and cost required to implement recovery. (For Pacific salmon, "Secretary" refers to the Secretary of Commerce.)

Redd - Nest made in gravel dug by a fish for egg deposition (and then filled), and associated gravel mounds.

Removable Spillway Weir (RSW) - A fish passage technology that is an overflow structure installed in a dam's spillway bay. It provides a more surface-oriented passage route with less delay and stress for juvenile anadromous fish.

Recruitment - The number of young-of-year fish entering a population in a given year.

Recruit-Spawner (R/S) - A measure of productivity that directly reflects the ability of a population to sustain itself. A R/S estimate simply reflects the rate at which spawning adults in one generation are replaced by spawning adults in the next generation. A R/S value < 1.0 indicates the population is not replacing itself. If this pattern continues over a sufficient period of time, the population will become extinct. Conversely, R/S >1.0 indicates the population is more than replacing itself; R/S = 1.0 means the population is exactly replacing itself. Estimating R/S requires a time series of data on adult returns.

Remand Collaboration - In 2005 Federal Judge James Redden ordered NMFS and the Action Agencies to form a Policy Work Group (PWG) to collaborate with sovereign States and Tribes to develop items to be included in the FCRPS proposed action, clarify policy issues, and reach agreement or narrow the areas of disagreement on scientific and technical information. The members of the PWG were NMFS, the Action Agencies, Idaho, Montana, Oregon, and Washington, and Native American Tribes (the Nez Perce Tribe, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes and Bands of the Yakama Indian Nation, the Confederated Tribes of the Colville Reservation, the Spokane Tribe of Indians, and Kootenai Tribe of Idaho).

Reservoir - A body of water collected and stored in an artificial lake behind a dam.

Resident fish - Fish that spend their entire life cycle in freshwater. For program purposes, resident fish includes landlocked anadromous fish (e.g., white sturgeon, kokanee and coho), as well as traditionally defined resident fish species.

Resident fish substitutions - The enhancement of resident fish to address losses of salmon and steelhead in those areas permanently blocked to anadromous (ocean-migrating) fish as a result of hydroelectric dams.

Riffle - A shallow extending across the bed of a stream over which water flows swiftly so that the surface of the water is broken in waves.

Riparian areas and wetlands - Riparian areas and wetlands are habitats where terrestrial and aquatic ecosystems are most closely linked. They are among the most diverse and dynamic habitats on the Earth, and are especially important sources of plant and animal species diversity in arid areas such as the interior Columbia River Basin. These habitats are critical to a broad range of wildlife.

Riparian habitat - Habitat along the banks of streams, lakes or rivers.

Rivermile - Miles calculated from the mouth of the river or, for upstream tributaries, from the confluence with the main river.

Rule curves - Graphic guides to the use of storage water. They are developed to define certain operating rights, entitlements, obligations and limitations for each reservoir.

Run - A population of fish of the same species consisting of one or more stocks migrating at a distinct time.

Salmonid - A fish of the Salmonidae family, which includes soft-finned fish such as salmon, trout, and whitefish.

Section 7 - The section of the Endangered Species Act that requires all Federal agencies, in "consultation" with the Service, to insure that their actions are not likely to jeopardize the continued existence of listed species or result in destruction or adverse modification of critical habitat.

Self-Sustaining Population - A population of salmonids, sturgeon, lamprey, native or non-native fish that exists in sufficient numbers to replace itself through time without supplementation with hatchery fish. It does not necessarily produce surplus fish for harvest.

Settlement - An agreement between natural resource trustees and responsible parties that specifies the terms under which liability is resolved.

Sinuosity - The amount of bending, winding and curving in a stream or river. Often defined as channel length divided by straight line length.

Smolt - A juvenile salmon or steelhead migrating to the ocean and undergoing physiological changes (smoltification) to adapt its body from a freshwater to a saltwater existence, typically in its second year.

Smoltification - Process of physiologically changing from fry or parr to smolt.

Spatial - Spatial, in the context of the program, refers to the geographic distribution of individuals in a population unit and the processes that generate that distribution.

Spawn - The act of fish releasing and fertilizing eggs.

Species - A group of individuals of common ancestry that closely resemble each other structurally and physiologically and that can interbreed, producing fertile offspring.

For purposes of the Endangered Species Act (ESA), a species is defined to include "any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature."
A population (or group of populations) will be considered "distinct" (and hence a "species") for purposes of the ESA if it represents an evolutionarily significant unit (ESU) of the biological species. A population must satisfy two criteria to be considered an ESU:

1. It must be reproductively isolated from other conspecific population units, and
2. It must represent an important component in the evolutionary legacy of the species.

Spill - Releasing water through spillways at a dam rather than through the turbines.

Spillway - The channel or passageway around or over a dam through which excess water is released or "spilled" past the dam without going through the turbines. A spillway is a safety valve for a dam and, as such, must be capable of discharging major floods without damaging the dam, while maintaining the reservoir level below some predetermined maximum level.

Stock - A population of fish spawning in a particular stream during a particular season. Stocks of fish generally do not interbreed with stocks spawning in a different stream or at a different time.

Stray - An individual that breeds in a population other than that of its parents.

Stream type migrant - A juvenile fish that spends a winter or longer at or below the natal stream before migrating to the ocean.

Stream morphology - The study of the form and structure of streams, used interchangeably with stream geomorphology.

Subbasin - A set of adjoining watersheds with similar ecological conditions and tributaries that ultimately connects, flowing into the same river or lake. Subbasins contain major tributaries to the Columbia and Snake rivers. There are 62 subbasins in the Columbia River Watershed.

Subyearling - Fish that are less than 1 year old

Subbasin assessment - The assessment is the technical evaluation of the biological and physical characteristics of the subbasin. Its primary purpose is to bring together technical information for the analysis needed to develop biological objectives.

Subbasin planning - A coordinated systemwide approach to planning in which each subbasin in the Columbia system is evaluated for its potential to produce fish in order to contribute to the goal of the overall system. Subbasin planning emphasizes the integration of fish and wildlife habitat, fish passage, harvest management, and production.

Supplementation - The use of artificial propagation to reestablish or increase the abundance of naturally reproducing populations through the release of hatchery fry and juvenile fish in the natural environment.

Tailrace - The canal or channel that carries water away from the dam.

Tailwater - The water surface immediately downstream from a dam.

Take - From Section 3(18) of the Federal Endangered Species Act: "The term 'take' means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

Target species - A species singled out for attention because of its harvest significance or cultural value, or because it represents a significant group of ecological functions in a particular habitat type.

Technical Management Team - A technical working group established by the National Marine Fisheries Service to provide advice on how to operate the federal dams in the Columbia River Basin in a manner that minimizes fish and wildlife impacts. The TMT deals with issues such as reservoir storage levels, flow augmentation, and spill.

Terrestrial - Of or relating to the earth or its inhabitants. Non aquatic.

Threatened - The classification provided to an animal or plant likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Transboundary - Refers to the United States and Canadian border.

Transboundary Stocks - Stocks whose range and/or migratory routes cross political jurisdictions.

Transportation - Collecting migrating juvenile fish and transporting them around the dams using barges or trucks.

Treaty - The Treaty between the United States of America and Canada Relating to Cooperative Development of the Water Resources of the Columbia River Basin, 1964. The Canadian Entity (B.C. Hydro) and the U.S. Entity (represented by the U.S. Army Corps of Engineers and Bonneville Power Administration) are responsible for ensuring the provisions of the Columbia River Treaty are fulfilled. It became effective on September 16, 1964. The treaty also authorized the construction of Libby Dam on the Kootenai River in Montana, which creates a reservoir that extends into British Columbia.

Treaty Rights - Rights of Indian tribes that were reserved by the 1855 Stevens Treaties between Indian tribes and the United States government. These reserved rights include

the right of "taking fish at all usual and accustomed grounds and stations" as well as the "privilege of hunting, gathering roots and berries and pasturing horses on open and unclaimed lands." Certain of these rights have been fairly well defined by judicial decisions, such as those pertaining to treaty fishing.

Tribes - In the Council's fish and wildlife program, these include the Burns-Paiute Tribe; the Coeur d'Alene Tribes; the Confederated Tribes of the Colville Reservation; the Confederated Salish-Kootenai Tribes of the Flathead Reservation; the Confederated Tribes of the Umatilla Reservation of Oregon; the Confederated Tribes of the Warm Springs Reservation of Oregon; the Confederated Tribes and Bands of the Yakama Nation; the Kalispel Tribe of Indians; the Kootenai Tribe of Idaho; the Nez Perce Tribe of Idaho; the Shoshone-Paiutes of the Duck Valley Reservation; the Shoshone-Bannock Tribes of the Fort Hall Reservation; and the Spokane Tribe of Indians.

Turbidity - A measure of light penetration in a body of water. Higher turbidity indicates "murkier" water conditions.

Uplands - Land at higher elevations than the alluvial plain or low stream terrace; all lands outside the riparian-wetland and aquatic zones.

***U.S. v Oregon* -** The 1969 federal court decision that reaffirmed treaty rights to fish. The decision only applies to Washington and Oregon treaty tribes and is the basis for allocating harvest of salmon in the Columbia River to those tribes.

Water Management Plan - The purpose of the Water Management Plan (WMP) is to layout how the Action Agencies plan to operate the FCRPS projects (Bonneville Dam and above - not including the Willamette Projects or Upper Snake River) during the current water year (October – September).

Water Right - A legal authorization to use a certain amount of public water for specific beneficial use or uses.

Watershed - The area that drains into a stream or river. A subbasin is typically composed of several watersheds.

Weak stock - A stock of fish of which the long-term survival is in doubt. Typically this is a stock in which the population is small and is barely reproducing itself or is not reproducing itself. While ESA-listed stocks are considered weak stocks, the term also includes other populations that would not yet qualify for ESA listing.

Wildlife - Animals living in a natural state, unimpeded and undomesticated by humans.

Wildlife management - The application of scientific or technical principles to the practice of manipulating wildlife populations, either directly through regulating the numbers, ages, and sex ratios harvested, or indirectly by providing favorable habitat conditions and alleviating limiting factors.

Wild fish - Fish that have maintained successful natural reproduction with little or no supplementation from hatcheries.

Yearling - Fish one year old or older.

Acronyms

Acronym	Terminology
AFEP	Anadromous Fish Evaluation Program
AHA	All “H” Analyzer
ALF	Albeni Falls Dam
APRE	Artificial Production Review Evaluation
BA	Biological Assessment
BGS	Behavioral guidance structure
BiOp	Biological Opinion
BLM	Bureau of Land Management
BMP	Best Management Practice
BOG	Budget Oversight Group
BON	Bonneville Dam
BOR	U.S. Bureau of Reclamation
BRN	Brownlee Dam
BY	brood year
CBT	Columbia Basin Trust
CBWTP	Columbia Basin Water Transaction Program
CFR	Code of Federal Regulations
cfs	Cubic feet per second. A unit commonly used to quantify discharge rate.
CHJ	Chief Joseph Dam
Corps	U. S. Army Corps of Engineers
CREP	Conservation Reserve Enhancement Program
CRITFC	Columbia River Intertribal Fish Commission (Yakama, Nez Perce, Umatilla and Warm Springs tribes)
CWA	Clean Water Act
CWT	coded-wire tag
DPS	Distinct Population Segment
DWR	Dworshak Dam
EPA	U. S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FCOP	Flood Control Operating Plan
FCRPS	Federal Columbia River Power System
FERC	U.S. Federal Energy Regulatory Commission
FGE	Fish Guidance Efficiency
GBD	Gas bubble disease
HCD	Hells Canyon Dam
HCP	Habitat Conservation Plan
HEP	Habitat Evaluation Procedure
HGH	Hungry Horse Dam
HGMP	Hatchery and Genetic Management Plan
HOF	Hatchery origin fish

HSRG	Hatchery Scientific Review Group
HU	Habitat Unit
IHR	Ice Harbor Dam
IMW	Intensively Monitored Watershed
IOSC	Idaho Office of Species Conservation
ISAB	Independent Scientific Advisory Board
ISRP	Independent Science Review Panel
JBS	Juvenile Bypass System
JDA	John Day Dam
Kcfs	Thousand cubic feet per second
LCFRB	Lower Columbia Fish Recovery Board
LCREP	Lower Columbia River Estuary Partnership
LIB	Libby Dam
LGS	Little Goose Dam
LMN	Lower Monumental Dam
LWG	Lower Granite Dam
MAF	Million acre-feet
MCN	McNary Dam
MERR	Monitoring, Evaluation, Research and Reporting
MFWP	Montana Fish, Wildlife & Parks
MMPA	Marine Mammal Protection Act
MOC	mid-Oregon coast
MPG	Major population group
NEPA	National Environmental Policy Act
NEOH	Northeast Oregon Hatchery
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOF	Natural origin fish
NWFSC	Northwest Fisheries Science Center
ODFW	Oregon Department of Fish and Wildlife
PA	Proposed Action
PIT-tag	Passive Integrated Transponder (tag)
PUD	Public Utility District
PWG	Policy Work Group
QET	Quasi-extinction Threshold
RMP	Resource Management Plan (for exemption from ESA section 9 take prohibitions under limit 6 of the 4(d) rule)
RPA	Reasonable and Prudent Alternative
RSW	Removable Spillway Weir
SAFE	Select Area Fisheries Enhancement
SAR	Smolt to adult return rate
SCH	Spring Creek Hatchery (tule fall Chinook returning to Spring Creek Hatchery)
SLED	Sea Lion Exclusion device
SRSRB	Snake River Salmon Recovery Board

TDA	The Dalles dam
TDG	Total Dissolved Gas
TMDL	Total Maximum Daily Load
TRT	Technical Recovery Team
TSW	Temporary Spillway Weir
UCSRB	Upper Columbia Salmon Recovery Board
UCUT	Upper Columbia United Tribes
URB	upper river brights (naturally spawning bright fall Chinook normally migrating past McNary Dam)
URC	Upper Rule Curve
USF&WS	U. S. Fish & Wildlife Service
USRT	Upper Snake River Tribes
VAR-Q	variable flow schedule - VAR (variable) Q (flow)
WDFW	Washington Department of Fish and Wildlife
WSF	Water supply forecast
YBFWRB	Yakima Basin Fish & Wildlife Recovery Board

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Appendix B: Hydroelectric Development Conditions

Future Hydroelectric Development

Much of this program has focused on mitigating damage done to Columbia River Basin fish and wildlife by hydropower development and operations in the past. But the future is equally important. The Corps of Engineers and the Bureau of Reclamation continue to study the need for additional federal hydroelectric projects and to plan for new development in the basin. The Federal Energy Regulatory Commission has many permits and applications pending for hydroelectric development in Idaho, Oregon, Montana and Washington. Many of those applications and permits are for projects throughout the Columbia River Basin. Dozens of small or medium-sized hydroelectric projects are proposed for tributary drainage basins that contain important anadromous fish habitat. However, most new hydroelectric development will be accomplished by private or non-federal public entities licensed by the Federal Energy Regulatory Commission.

Many of the proposals are for hydroelectric projects that would produce less than 5 megawatts of electricity. Although individual small projects may have no significant adverse effects on the fish and wildlife resources of the basin, the cumulative effects of such development throughout a river basin could be quite harmful. These cumulative effects need to be taken into account fully.

The Council estimates that 4,600 stream miles of Columbia River Basin salmon and steelhead spawning and rearing habitat have been lost to development, not including losses of migration routes and of resident fish and wildlife habitat. Minimizing further habitat loss is especially important in view of the Council's goal of doubling salmon and steelhead runs in the Columbia River Basin consistent with system policies (see Sections 2 and 4). Development in critical fish and wildlife areas leads to divisive and expensive conflicts that the Council believes can be avoided through resource planning.

The Council finds that future hydroelectric developers in the basin should be required to mitigate harm to fish and wildlife and has adopted program measures calling for such mitigation. New hydroelectric development has the potential to cause further damage to the basin's fish and wildlife resources as well as to negate ongoing Council efforts to remedy damage caused by the existing hydropower system. Federal agencies also should assess and mitigate the cumulative effects on fish and wildlife of multiple hydroelectric projects.

The Council also intends to continue to review applications for Federal Energy Regulatory Commission permits and licenses and for Corps of Engineers and Bureau of Reclamation proposals for hydroelectric development. The purpose of this review is to identify program measures related to the proposed development to ensure that any new development in the basin is consistent with this fish and wildlife program and the Council's Northwest Power Plan. The Council's reviews would complement and recognize, not supplant, the role of the fish and wildlife agencies and tribes in reviewing proposals for hydroelectric projects.

1. Future Hydroelectric Development

a. Conditions

Federal Energy Regulatory Commission, Corps of Engineers, Bureau of Reclamation and Bonneville

Do not license, exempt from license, relicense, propose, recommend, agree to acquire or wheel power from, grant billing credits for, or otherwise support any hydroelectric development in the Columbia River Basin without specifically providing for these development conditions:

- Consultation with the fish managers and the Council throughout study, design, construction and operation of the project;
- Specific plans for flows and fish facilities prior to construction;
- The best available means for aiding downstream and upstream passage of anadromous and resident fish;
- Flows and reservoir levels of sufficient quantity and quality to protect spawning, incubation, rearing and migration;
- Full compensation for unavoidable fish losses or fish habitat losses through habitat restoration or replacement, appropriate propagation, or similar measures consistent with the provisions of this program;
- Assurance that the project will not inundate the usual and accustomed, traditional or contemporary fishing places of any tribe without tribal approval;
- Assurance that the project will not degrade fish habitat or reduce numbers of fish in such a way that the exercise of treaty or executive order tribal rights will be diminished;
- Assurance that all fish protection measures are fully operational at the time the project begins operation;
- The collection of data needed to monitor and evaluate the results of the fish protection efforts; and
- Assurance that the project will not degrade water quality beyond the point necessary to sustain sensitive fish species (as designated in consultation with the fish managers).

Do not license, relicense, exempt from license, propose, recommend, agree to acquire or wheel power from, grant billing credits for, or otherwise support any hydroelectric development in the Columbia River Basin without specifically providing for these development conditions:

- Consultation with wildlife managers and the Council throughout study, design, construction and operation of the project;

- Avoiding inundation of wildlife habitat, insofar as practical;

- Timing construction activities, insofar as practical, to reduce adverse effects on nesting and wintering grounds;

- Locating temporary access roads in areas to be inundated;

- Constructing subimpoundments and using all suitable excavated material to create islands, if appropriate, before the reservoir is filled;

- Avoiding all unnecessary or premature clearing of land before filling the reservoir;

- Providing artificial nest structures when appropriate;

- Avoiding construction, insofar as practical, within 250 meters of active raptor nests;

- Avoiding critical riparian habitat (as designated in consultation with the wildlife managers) when clearing, riprapping, dredging, disposing of spoils and wastes, constructing diversions, and relocating structures and facilities;

- Replacing riparian vegetation if natural revegetation is inadequate;

- Creating subimpoundments by diking backwater slough areas, creating islands and nesting areas;

- Regulating water levels to reduce adverse effects on wildlife during critical wildlife periods (as defined in consultation with the fish and wildlife managers);

- Improving the wildlife capacity of undisturbed portions of new project areas (through such activities as managing vegetation, reducing disturbance, and supplying food, cover and water) as compensation for otherwise unmitigated harm to wildlife and wildlife habitat in other parts of the project area;

- Acquiring land or management rights, such as conservation easements, where necessary to compensate for lost wildlife habitat at the same time other project land is acquired and including the associated costs in project cost estimates;

- Funding operation and management of the acquired wildlife land for the life of the project;

- Granting management easement rights on the acquired wildlife lands to appropriate management entities;

- Collecting data needed to monitor and evaluate the results of the wildlife protection efforts;

- Assurance that the project will not inundate the usual and accustomed, traditional or contemporary hunting places of any tribe without tribal approval; and

- Assurance that the project will not degrade wildlife habitat or reduce numbers of wildlife in such a way that the exercise of treaty or executive order tribal rights will be diminished.

Ensure that all licenses for hydroelectric projects or documents that propose, recommend or otherwise support hydroelectric development explain in detail how the provisions of this section will be accomplished or the reasons why the provisions cannot be incorporated into the project.

2. Protected Areas

From the inception of this program, the Council has supported the concept of protecting some streams and wildlife habitats from hydroelectric development, where the Council believes such development would have major negative impacts that could not be reversed. Beginning in 1983, the Council directed extensive studies of existing habitat and has analyzed alternative means of protection. In 1988, the Council concluded that: 1) the studies had identified fish and wildlife resources of critical importance to the region; 2) mitigation techniques cannot assure that all adverse impacts of hydroelectric development on these fish and wildlife populations will be mitigated; 3) even small hydroelectric projects may have unacceptable individual and cumulative impacts on these resources; and 4) protecting these resources and habitats from hydroelectric development is consistent with an adequate, efficient, economical, and reliable power supply. The Council, relying on these studies, designated certain river reaches in the basin as "protected areas," where the Council believes hydroelectric development would have unacceptable risks of loss to fish and wildlife species of concern, their productive capacity or their habitat.

River reaches to be protected are those reaches or portions of reaches listed on the "Protected Areas List" adopted by the Council on August 10, 1988, and subsequently. For each river reach listed on the Protected Areas List, the fish and wildlife to be protected are those on the list. The Council will supply a copy of the Protected Areas List to any party free of charge.

a. Protect Areas From New Hydropower Development

The following are not affected by protected areas:

- Any hydroelectric facility or its existing impoundment that as of August 10, 1988, had been licensed or exempted from licensing by the Federal Energy Regulatory Commission;

- The relicensing of such hydroelectric facility or its existing impoundment;

- Any modification of any existing hydroelectric facility or its existing impoundment; and

- Any addition of hydroelectric generation facilities to a non-hydroelectric dam or diversion structure.

- Transition projects: The Council recognizes that there exist, as of August 10, 1988, applications for hydroelectric projects that are in various stages of completion before the Federal Energy Regulatory Commission. In many cases the applicants have made substantial investments and have completed, or nearly completed, agreements with all interested parties, including state fish and wildlife agencies. The Council recognizes that the Federal Energy Regulatory Commission may be obligated to complete its processes on these applications, but expects where possible that this measure will be taken into account to the fullest extent practicable.

  The Council recognizes that there may exist preliminary permits or applications for licenses or exemptions for hydroelectric projects at sites that were not previously within protected areas, but which may be included within protected areas as a result of amendments approved by the Council. An important purpose of protected areas is to encourage developers to site projects outside protected areas. The Council therefore exempts from the effect of an amendment that designates a previously unprotected area as protected, any project for which the developer had obtained a preliminary permit or filed an application for license or exemption prior to the date on which the Council entered rulemaking on the amendment. However, it is the Council's intention that the Federal Energy Regulatory Commission give full consideration to the protection of fish and wildlife resources located at these project sites and provide suitable protection and mitigation for such resources in the event that a license or exemption is approved.

- Effect on water rights and riparian areas: This measure should not be interpreted to authorize the appropriation of water by any entity or individual, affect water rights or jurisdiction over water, or alter or establish any water or water-related right. The Council does not intend this measure to alter or affect any state or federal water quality classification or standards, or alter any management plan

developed pursuant to the national Forest Management Act, 16 U.S.C. 1601, et seq., or the Federal Land Policy Management Act, 43 U.S.C. 1701, et seq., except to the extent planning decisions are directly related to hydropower licensing and development. Nor should this measure be interpreted to alter, amend, repeal, interpret, modify, or conflict with any interstate compact made by the states. If this measure is found by a court or other competent authority to conflict with any other interstate compact, this measure will terminate with respect to the area involved, without further action of the Council.

This measure applies to river reaches, or portions of river reaches, and to river banks or surrounding areas only where such areas would be directly affected by a proposed hydroelectric project. In adopting this measure, the Council has not attempted to balance all the factors that may be relevant to land management determinations.

b. Bonneville Power Administration

Do not acquire power from hydroelectric projects located in protected areas. The Council believes that the Long-Term Intertie Access Policy's reliance on protected areas is consistent with the Council's power plan and fish and wildlife program as they apply to fish and wildlife in the Columbia River Basin. The Council continues to recommend that Bonneville adopt a similar policy with respect to protected areas outside the Columbia River Basin.

c. Federal Energy Regulatory Commission

Under the Northwest Power Act, the Federal Energy Regulatory Commission, and all other federal agencies responsible for managing, operating, or regulating federal or non-federal hydroelectric facilities located on the Columbia River or its tributaries are required to take protected area designations into account to the fullest extent practicable at all relevant stages of decision-making processes. The Council recognizes that the Federal Energy Regulatory Commission makes licensing and exemption decisions for nonfederal projects, and does not expect that the Commission will abandon its normal processes with regard to projects located in protected areas. Rather, consistent with Section 4(h)(11) of the Northwest Power Act, the Council expects that the Federal Energy Regulatory Commission will take the Council's judgment into account, and implement that judgment in licensing and exemption decisions unless the Federal Energy Regulatory Commission's legal responsibilities require otherwise.

3. Additional Protections and Consistency of Hydropower Development

a. Cumulative Effects

Federal Project Operators and Regulators

Review simultaneously all applications or proposals for hydroelectric development in a single river drainage, through consolidated hearings, environmental impact statements or assessments, or other appropriate methods. This review shall assess cumulative environmental effects of existing and proposed hydroelectric development on fish and wildlife.

b. Ensure Consistency With This Program

Federal Energy Regulatory Commission

Require all applicants for licenses (including license renewals, amendments and exemptions) and preliminary permits in the Columbia River Basin to demonstrate in their applications how the proposed project would take this program into account to the fullest extent practicable.

Provide the Council with copies of all applications for licenses (including license renewals, amendments and exemptions) and preliminary permits in the Columbia River Basin so that the Council can comment in a timely manner on the consistency of the proposed project with this fish and wildlife program. This provision is not intended to supplant review of such applications by the fish and wildlife agencies and tribes.

Federal Land Managers and Federal and State Fish and Wildlife Agencies

Incorporate pertinent elements of the fish and wildlife program in the terms and conditions they apply to projects exempted from licensing under Federal Energy Regulatory Commission exemption procedures. The Council also requests federal land managers to incorporate this program into their permit procedures related to hydroelectric development on lands they manage.

Corps of Engineers, Bureau of Reclamation, and any Other Federal Agency Studying or Proposing Hydroelectric Development in the Columbia River Basin

Provide opportunity for Council review and comment.

Appendix C: Wildlife Provisions

Mitigation Priorities

Bonneville and Wildlife Managers

Ensure that wildlife mitigation projects implemented in fulfillment of this program are consistent with the basinwide implementation priorities described in Tables 11-1, 11-2 and 11-3, below.

Table 11-1 Lower Columbia Subbasin Wildlife Mitigation Priorities

Habitat Types--Target Species	Priority
Riparian/Riverine • Great Blue Heron	High
Old Growth Forest • Northern Spotted Owl	High
Wetlands • Great Blue Heron • Band-tailed Pigeon • Western Pond Turtle	High
Coniferous Forest • Ruffed Grouse • Elk • American Black Bear/Cougar	Medium

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Table 11-2 Upper Columbia Subbasin Wildlife Mitigation Priorities	
Habitat Types--Target Species	**Priority**
Riparian/River • Bald Eagle (breeding) • Black-capped Chickadee • Peregrine Falcon	High
Shrub-Steppe • Sharp-tailed Grouse • Pygmy Rabbit • Sage Grouse • Mule Deer	High
Wetlands • Mallard • Redhead	High
Islands • White Pelicans	Medium
Agricultural Lands • Swainson's Hawk • Ring-necked Pheasant	Low

2

Table 11-3 Snake River Subbasin Wildlife Mitigation Priorities	
Habitat Type--Target Species	**Priority**
Riparian/Riverine • Bald Eagle (breeding) • Bald Eagle (wintering) • River Otter • Black-capped Chickadee • Peregrine Falcon • Ruffed Grouse	High
Wetlands • Mallard	High
Native Grasslands and Shrubs • Mule Deer/Elk • White-tailed Deer • Sharp-tailed Grouse	Medium
Coniferous Forest • Elk	Medium

Old Growth Forest • Pileated Woodpecker	Medium
Lowland Forest • White-tailed deer	Low

Table 11-4 identifies the losses due to hydropower construction at federal dams in the Columbia River Basin.

Table 11-4 Estimated Losses Due to Hydropower Construction (losses are preceded by a "-", gains by a "+")	
Species	**Total Habitat Units**
Albeni Falls	
• Mallard Duck	-5,985
• Canada Goose	-4,699
• Redhead Duck	-3,379
• Breeding Bald Eagle	-4,508
• Wintering Bald Eagle	-4,365
• Black-Capped Chickadee	-2,286
• White-tailed Deer	-1,680
• Muskrat	-1,756
• Yellow Warbler	+171
Lower Snake Projects	
• Downy Woodpecker	-364.9
• Song Sparrow	-287.6
• Yellow Warbler	-927.0
• California Quail	-20,508.0
• Ring-necked Pheasant	-2,646.8
• Canada Goose	-2,039.8
Anderson Ranch	
• Mallard	-1,048
• Mink	-1,732
• Yellow Warbler	-361
• Black Capped Chickadee	-890
• Ruffed Grouse	-919
• Blue Grouse	-1,980
• Mule Deer	-2,689
• Peregrine Falcon	-1,222 acres*
* Acres of riparian habitat lost. Does not require purchase of any lands.	
Black Canyon	
• Mallard	-270
• Mink	-652
• Canada Goose	-214
• Ring-necked Pheasant	-260
• Sharp-tailed Grouse	-532
• Mule Deer	-242
• Yellow Warbler	+8
• Black-capped Chickadee	+68
Deadwood	
• Mule Deer	-2080
• Mink	-987
• Spruce Grouse	-1411
• Yellow Warbler	-309

Table 11-4 (cont.) Estimated Losses Due to Hydropower Construction (losses are preceded by a "-", gains by a "+")	
Species	**Total Habitat Units**
Palisades	
• Bald Eagle	-5,941 breeding -18,565 wintering
• Yellow Warbler/	-718 scrub-shrub
• Black Capped Chickadee	-1,358 forested
• Elk/Mule Deer	-2,454
• Waterfowl and Aquatic Furbearers	-5,703
• Ruffed Grouse	-2,331
• Peregrine Falcon*	-1,677 acres of forested wetland -832 acres of scrub-shrub wetland +68 acres of emergent wetland
* Acres of riparian habitat lost. Does not require purchase of any lands.	
Willamette Basin Projects	
• Black-tailed Deer	-17,254
• Roosevelt Elk	-15,295
• Black Bear	-4,814
• Cougar	-3,853
• Beaver	-4,477
• River Otter	-2,408
• Mink	-2,418
• Red Fox	-2,590
• Ruffed Grouse	-11,145
• California Quail	-2,986
• Ring-necked Pheasant	-1,986
• Band-tailed Pigeon	-3,487
• Western Gray Squirrel	-1,354
• Harlequin Duck	-551
• Wood Duck	-1,947
• Spotted Owl	-5,711
• Pileated Woodpecker	-8,690
• American Dipper	-954
• Yellow Warbler	-2,355
• Common Merganser	+1,042
• Greater Scaup	+820
• Waterfowl	+423
• Bald Eagle	+5,693
• Osprey	+6,159
Grand Coulee	
• Sage Grouse	-2,746
• Sharp-tailed Grouse	-32,723
• Ruffed Grouse	-16,502
• Mourning Dove	-9,316
• Mule Deer	-27,133
• White-tailed Deer	-21,362
• Riparian Forest	-1,632
• Riparian Shrub	-27
• Canada Goose Nest Sites	-74

Table 11-4 (cont.) Estimated Losses Due to Hydropower Construction (losses are preceded by a "-", gains by a "+")	
Species	**Total Habitat Units**
McNary	
• Mallard (wintering)	+ 13,744
• Mallard (nesting)	-6,959
• Western Meadowlark	-3,469
• Canada Goose	-3,484
• Spotted Sandpiper	-1,363
• Yellow Warbler	-329
• Downy Woodpecker	-377
• Mink	-1,250
• California Quail	-6,314
John Day	
• Lesser Scaup	+14,398
• Great Blue Heron	-3,186
• Canada Goose	-8,010
• Spotted Sandpiper	-3,186
• Yellow Warbler	-1,085
• Black-capped Chickadee	-869
• Western Meadowlark	-5,059
• California Quail	-6,324
• Mallard	-7,399
• Mink	-1,437
The Dalles	
• Lesser Scaup	+2,068
• Great Blue Heron	-427
• Canada Goose	-439
• Spotted Sandpiper	-534
• Yellow Warbler	-170
• Black-capped Chickadee	-183
• Western Meadowlark	-247
• Mink	-330
Bonneville	
• Lesser Scaup	+2,671
• Great Blue Heron	-4,300
• Canada Goose	-2,443
• Spotted Sandpiper	-2,767
• Yellow Warbler	-163
• Black-capped Chickadee	-1,022
• Mink	-1,622
Dworshak	
• Canada Goose-(breeding)	-16
• Black-capped Chickadee	-91
• River Otter	-4,312
• Pileated Woodpecker	-3,524
• Elk	-11,603
• White-tailed Deer	-8,906
• Canada Goose (wintering)	+323
• Bald Eagle	+2,678
• Osprey	+1,674
• Yellow Warbler	+119

Table 11-4 (cont.) Estimated Losses Due to Hydropower Construction (losses are preceded by a "-", gains by a "+"	
Species	**Total Habitat Units**
Minidoka	
• Mallard	+174
• Redhead	+4,475
• Western Grebe	+273
• Marsh Wren	+207
• Yellow Warbler	-342
• River Otter	-2,993
• Mule Deer	-3,413
• Sage Grouse	-3,755
Chief Joseph	
• Lesser Scaup	+1,440
• Sharp-tailed Grouse	-2,290
• Mule Deer	-1,992
• Spotted Sandpiper	-1,255
• Sage Grouse	-1,179
• Mink	-920
• Bobcat	-401
• Lewis' Woodpecker	-286
• Ring-necked Pheasant	-239
• Canada Goose	-213
• Yellow Warbler	-58

Monitor and Evaluate Wildlife Efforts at Non-federal Projects

Non-federal hydroelectric projects are licensed by the Federal Energy Regulatory Commission. The Electric Consumers Protection Act of 1986 (ECPA) mandates that the Federal Energy Regulatory Commission give equal consideration to the protection, mitigation of damage to, and enhancement of wildlife in licensing and relicensing decisions.

Mitigation Considerations in Dam Licensing Decisions

Federal Energy Regulatory Commission

In developing license conditions, take into account to the fullest extent practicable the policies established in this section, and the measures taken by Bonneville and others to implement this section. In particular, it is important to take into account the mitigation efforts at federal projects undertaken pursuant to this section, to ensure that license conditions are consistent with and complement these wildlife mitigation projects and contribute fully and proportionately to regional wildlife mitigation goals.

Council

The Council will monitor the Federal Energy Regulatory Commission licensing and relicensing proceedings and comment or intervene where appropriate.

Appendix D. Findings

To be developed.

Appendix E. Analysis of the Adequacy, Efficiency, Economy and Reliability of the Power System.

To be developed.

Appendix F. Estimates of Hydropower-Related Losses

"Compilation of Information on Salmon and Steelhead Losses in the Columbia River Basin" and "Numerical Estimates of Hydropower-Related Losses" from the 1987 Fish and Wildlife Program.